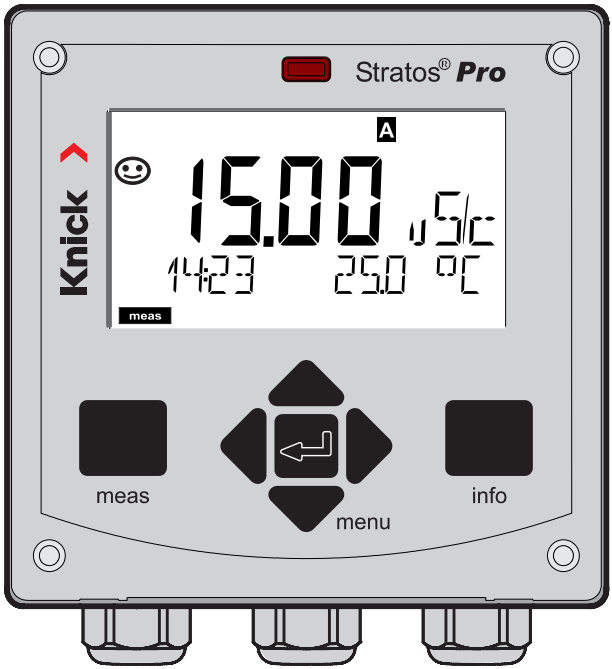
Stratos® Pro A2... CC

User Manual



Latest Product Information:

www.knick.de

81089

Knick

Warranty

Warranty
Defects occurring within 3 years from delivery date shall be remedied free of charge at our plant (carriage and insurance paid by sender). Sensors, fittings, and accessories: 1 year.

Subject to change without notice.

Return of products under warranty
Please contact our Service Team before returning a defective device. Ship the cleaned device to the address you have been given.
If the device has been in contact with process fluids, it must be decontaminated/disinfected before shipment. In that case, please attach a corresponding certificate, for the health and safety of our service personnel.

Disposal
Please observe the applicable local or national regulations concerning the disposal of "waste electrical and electronic equipment".

CD-ROM

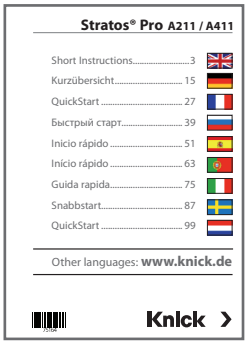
Complete documentation:

- Instruction manuals
- Safety instructions
- Short instructions

Safety Information

In official EU languages and others.

- ATEX / IECEX / FM / CSA
- EC Declarations of Conformity



Short Instructions

In German, English, French, Russian, Spanish, Portuguese, Italian, Swedish and Dutch.
More languages on CD-ROM and on our website: www.knick.de

- Installation and commissioning
- Operation
- Menu structure
- Calibration
- Error messages and recommended actions

Specific Test Report

Contents

Documents Supplied **3**

Introduction **7**
Intended Use 7

Safety Information **8**

Overview of Stratos Pro A2... CC **9**

Assembly **10**
Package Contents 10
Mounting Plan, Dimensions 11
Pipe Mounting, Protective Hood 12
Panel Mounting 13

Installation **14**
Installation Instructions 14
Rating Plates / Terminal Assignments 15
Wiring of Stratos Pro A201/A211 CC 16
Wiring Examples 17

User Interface, Keypad **20**

Display **21**
Signal Colors (Display Backlighting) 21

Measuring Mode **22**

Selecting the Mode / Entering Values **23**

Operating Modes **26**
Menu Structure of Modes and Functions 27
HOLD Mode 28
Alarm 29
Alarm and HOLD Messages 30

Overview of Configuration **31**

Setup and Channel Selection on the Device **32**

Sensors A and B – Arrangement **32**

Channel Selection and Display Assignment **32**

Calculations (CALC) 33

Configuration (Original for Copy) 40
Configuring Sensors A, B 42
Current Output 1 46
Current Output 2 54
CONTROL input 56
Alarm Settings 58
Time and Date 60
Tag Number 60

Calibration 62
Calibration by Input of Cell Factor 63

Measurement 64

Diagnostics 65

Service 70

Operating States 73

Product Line and Accessories 75

Specifications 76

Error Handling 80

Error Messages 81

Sensoface 83

FDA 21 CFR Part 11 85
Electronic Signature – Passcodes 85
Audit Trail 85

Index 86
Trademarks 91

Passcodes 92

Intended Use

Stratos Pro A2... CC is a 2-wire device for two-channel measurement of electrical conductivity and temperature in liquids. The device has been designed for measurements before and after cation exchangers using commercial 2- and 4-electrode sensors. Different parameters can be calculated from the two conductivity values, e.g. difference, ratio, rejection, but also the pH value of feed water.
The sturdy molded enclosure can be fixed into a control panel or mounted on a wall or at a post. The protective hood, which is available as accessory, provides additional protection against direct weather exposure and mechanical damage.

Plain-text messages in a large, backlit display allow intuitive operation. The colored display backlighting signals alarm messages (red) or HOLD mode (orange).
The "Sensocheck" automatic monitoring of sensor and cables and the "Sensoface" function for clear indication of the sensor condition provide excellent diagnostics.
The internal logbook (TAN SW-A002) can handle up to 100 entries – up to 200 with AuditTrail (TAN SW-A003).
Password protection for granting access rights during operation can be configured.
The floating, digital control input "HOLD" allows remote controlled switching to HOLD mode.
The "CONTROL" input allows evaluation of external monitoring equipment, such as a flow monitoring system. For that purpose, you can also monitor the current input (optional) for keeping a desired value.
The device provides two current outputs (for transmission of measured value and temperature, for example).

Safety Information

Safety information –
Be sure to read and observe the following instructions!
The device has been manufactured using state of the art technology and it complies with applicable safety regulations.
When operating the device, certain conditions may nevertheless lead to danger for the operator or damage to the device.

See also separate document:
- "Safety Instructions"

⚠ CAUTION!

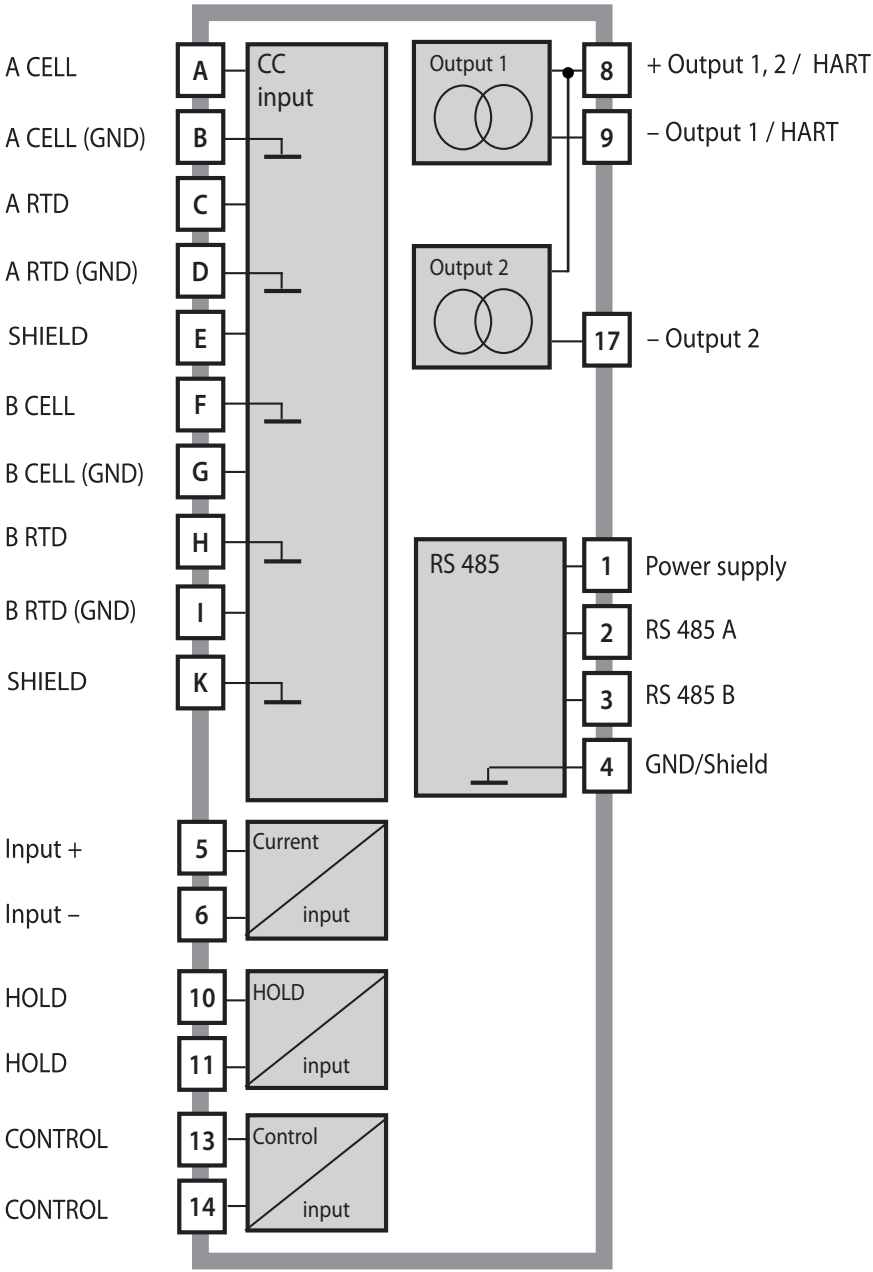
Commissioning must only be performed by trained personnel authorized by the operating company! Whenever it is likely that protection has been impaired, the device shall be made inoperative and secured against unintended operation.
The protection is likely to be impaired if, for example:
- the device shows visible damage
- the device fails to perform the intended measurements
- after prolonged storage at temperatures above 70°C
- after severe transport stresses

Before recommissioning the device, a professional routine test must be performed. This test must be carried out at the manufacturer's factory.

Please note:
Before commissioning it must be proved that the device may be connected with other equipment.

Terminals:
Screw terminal, suitable for single wires / flexible leads up to 2.5 mm^2 (AWG 14).
Recommended torque for the terminal screws: 0,5 ... 0.6 Nm.

Overview of Stratos Pro A2... CC



Assembly

Package Contents

Check the shipment for transport damage and completeness!

The package should contain:

- Front unit, rear unit, bag containing small parts
- Specific test report
- Documentation (cf Pg 3)
- CD-ROM

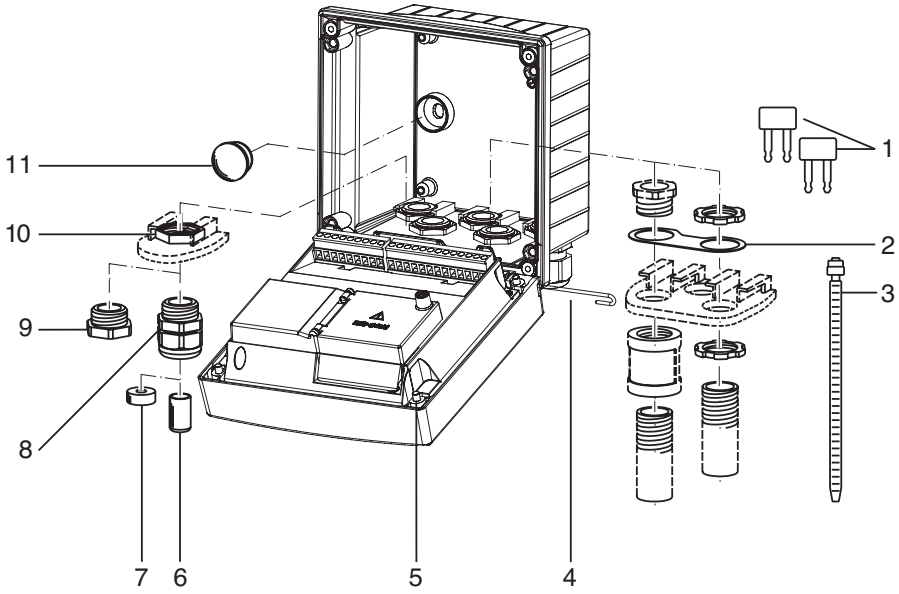
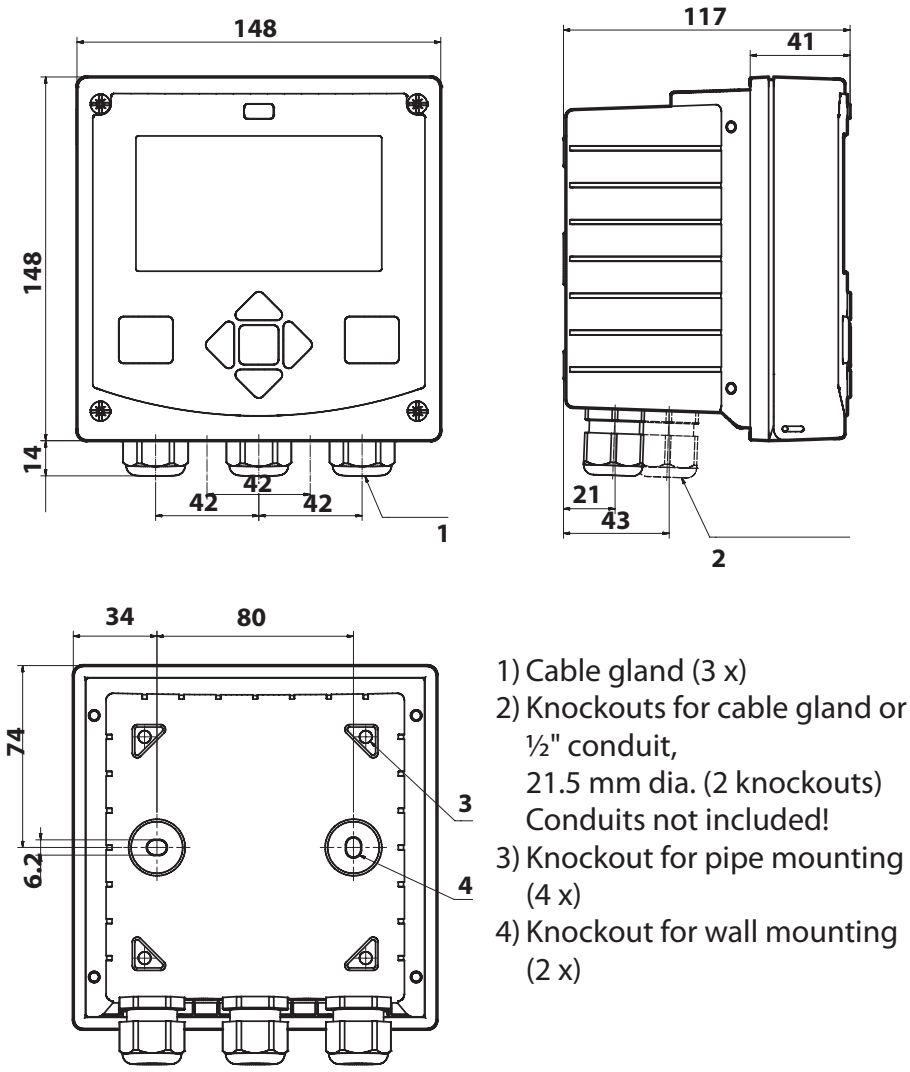


Fig.: Assembling the enclosure

1) Jumper (3 x)
2) Washer (1 x), for conduit mounting: Place washer between enclosure and nut
3) Cable tie (3 x)
4) Hinge pin (1 x), insertable from either side
5) Enclosure screw (4 x)
6) Sealing insert (1 x)
7) Rubber reducer (1 x)
8) Cable gland (3 x)
9) Filler plug (3 x)
10) Hexagon nut (5 x)
11) Sealing plug (2 x), for sealing in case of wall mounting

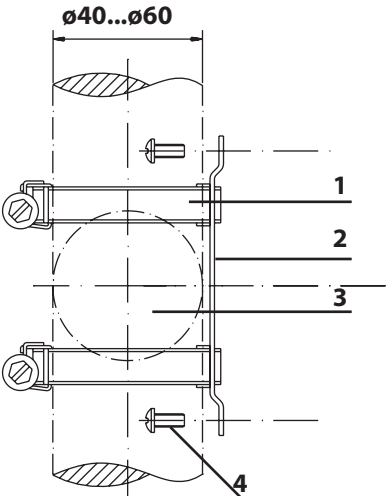
Mounting Plan, Dimensions



1) Cable gland (3 x)
2) Knockouts for cable gland or ½" conduit, 21.5 mm dia. (2 knockouts) Conduits not included!
3) Knockout for pipe mounting (4 x)
4) Knockout for wall mounting (2 x)

Fig.: Mounting plan (All dimensions in mm!)

Pipe Mounting, Protective Hood



1) Hose clamp with worm gear drive to DIN 3017 (2 x)
2) Pipe-mount plate (1 x)
3) For vertical or horizontal posts or pipes
4) Self-tapping screw (4 x)

Fig.: ZU 0274 pipe-mount kit (All dimensions in mm!)

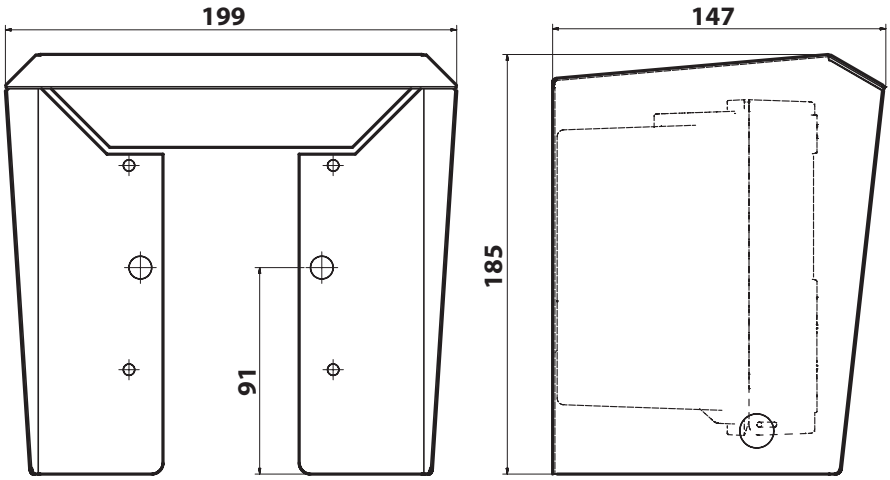
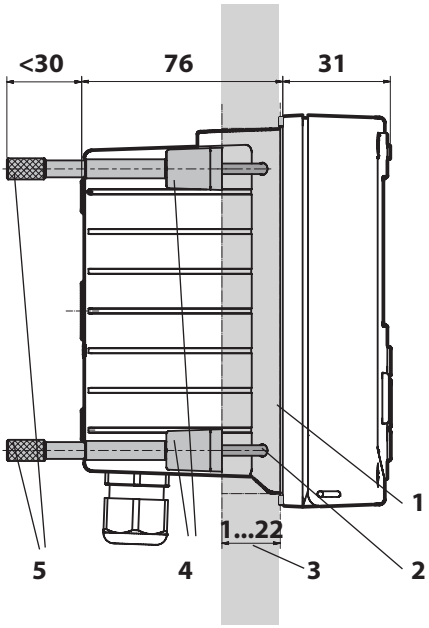


Fig.: ZU 0737 protective hood for wall and pipe mounting
(All dimensions in mm!)

Panel Mounting



1) Circumferential sealing (1 x)
2) Screw (4 x)
3) Position of control panel
4) Span piece (4 x)
5) Threaded sleeve (4 x)

Cutout
138 x 138 mm (DIN 43700)

Fig.: ZU 0738 panel-mount kit (All dimensions in mm!)

Installation

Installation Instructions

- Installation of the device must be carried out by trained experts in accordance with this instruction manual and as per applicable local and national codes.
- Be sure to observe the technical specifications and input ratings during installation!
- Be sure not to notch the conductor when stripping the insulation!
- The supplied current must be galvanically isolated. If not, connect an isolator module.
- All parameters must be set by a system administrator prior to commissioning!

Terminals:

suitable for single wires / flexible leads up to 2.5 mm^2 (AWG 14)

Rating Plates / Terminal Assignments

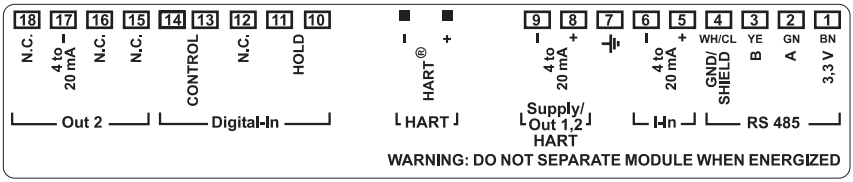


Fig.: Terminal assignments of Stratos Pro A2...

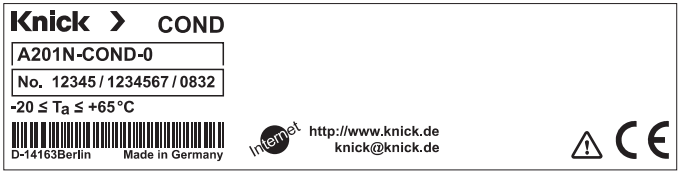
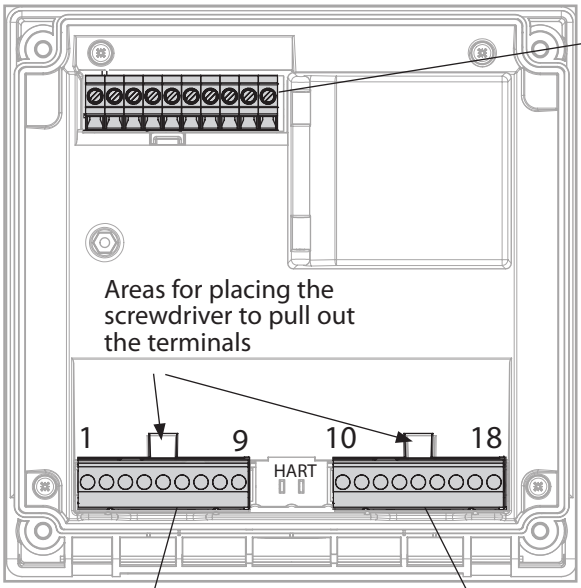
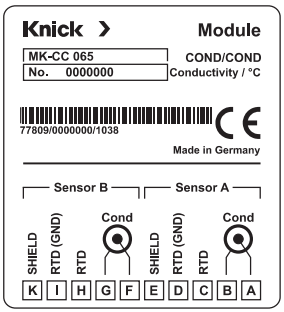


Fig.: Stratos Pro A2...N rating plate at outside bottom of front

Wiring of Stratos Pro A2... CC



Sensor connection MK-CC module	
A	A CELL
B	A CELL (GND)
C	A RTD
D	A RTD (GND)
E	SHIELD
F	B CELL
G	B CELL (GND)
H	B RTD
I	B RTD (GND)
K	SHIELD



Terminal row 1	
1	supply
2	RS 485 A
3	RS 485 B
4	GND/shield
5	+ input
6	– input
7	PA
8	+ out 1,2/HART
9	– out1/HART

Terminal row 2	
10	hold
11	hold
12	n.c.
13	contr.
14	contr.
15	n.c.
16	n.c.
17	– out 2
18	n.c.

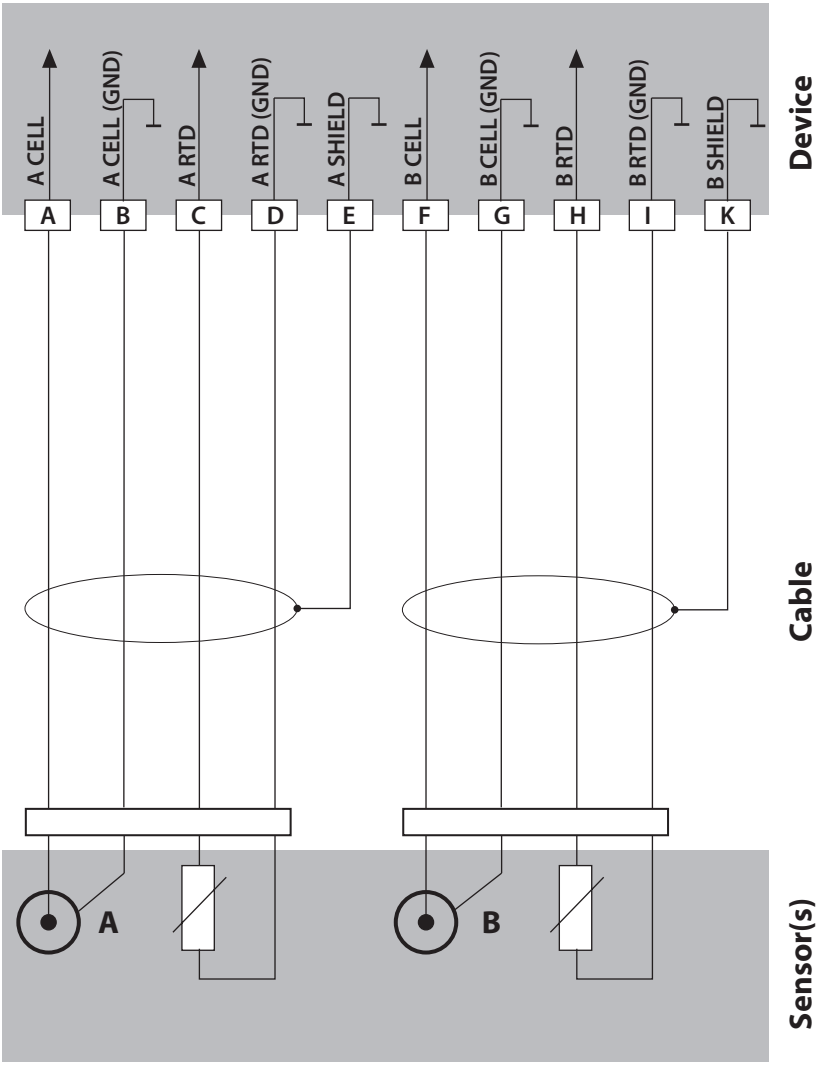
In addition:
2 HART pins (between terminal row 1 and 2)

Fig.: Terminals, device opened, back of front unit

Example 1:

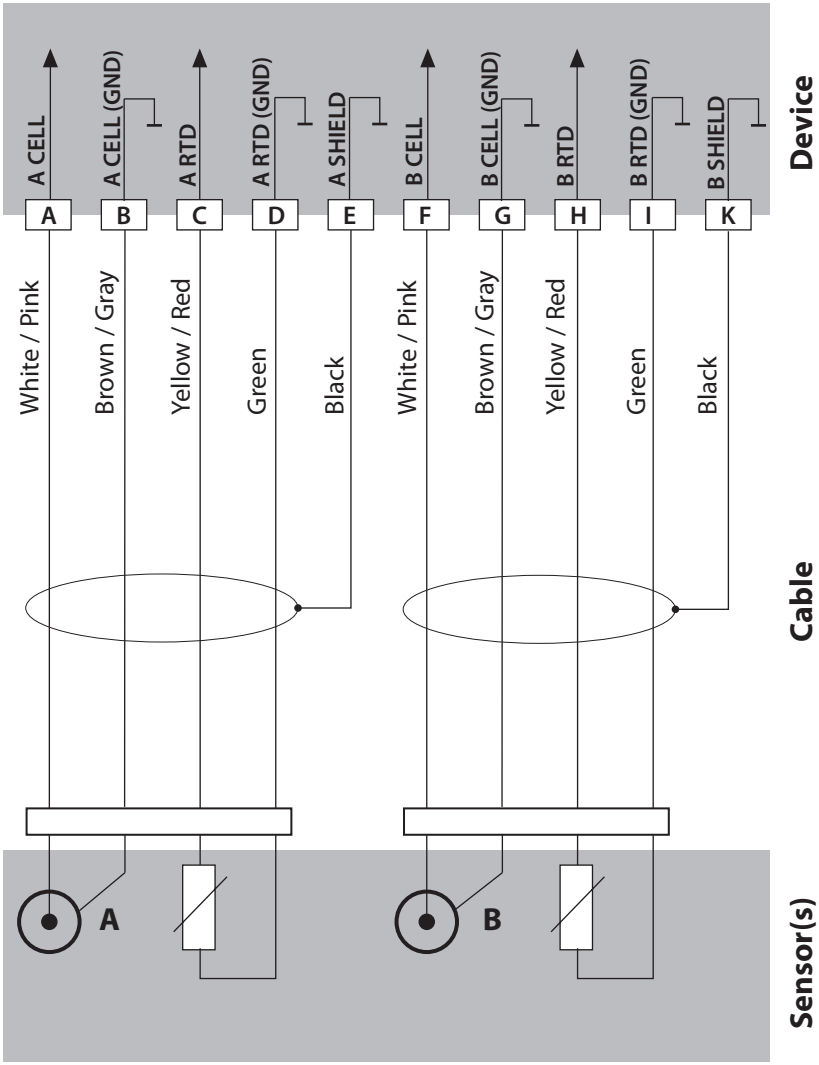
Measuring task: Dual conductivity, temperature

Sensors (principle): 2 electrodes, coaxial



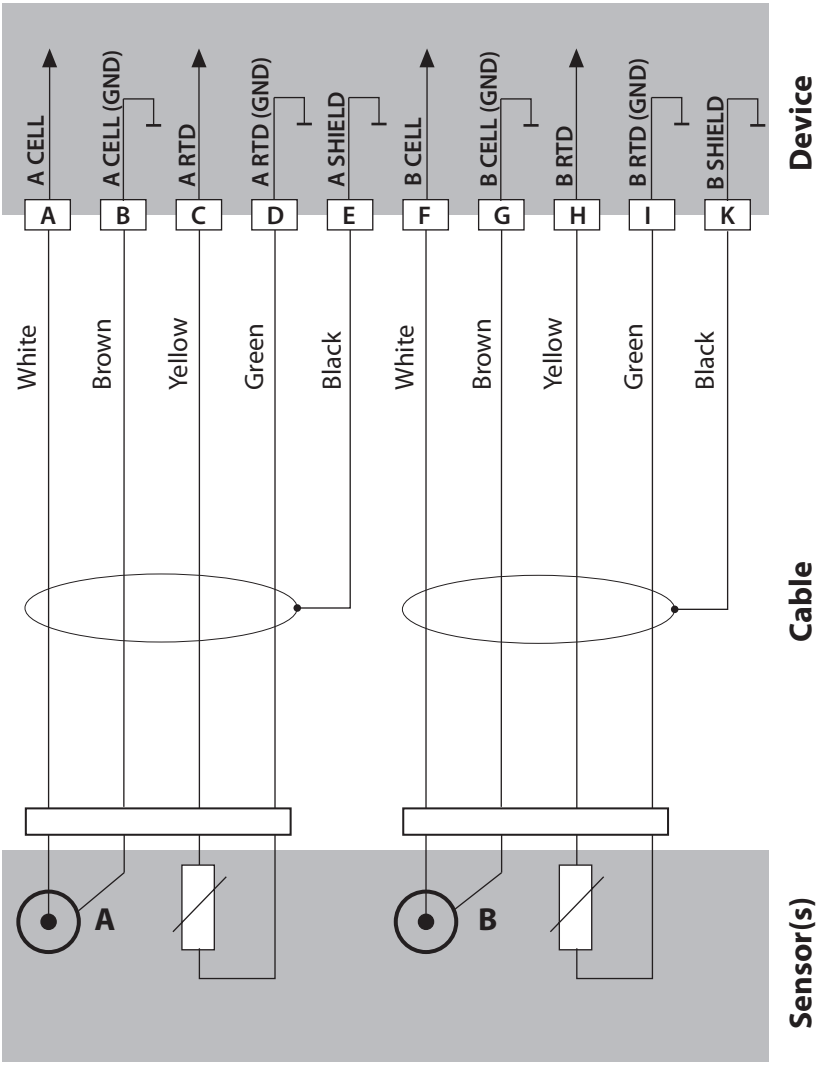
Example 2:

Measuring task: Dual conductivity, temperature
Sensors: SE 604, 2 electrodes

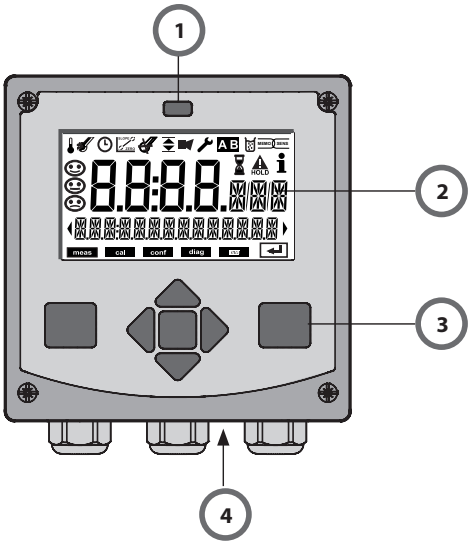


Example 3:

Measuring task: Dual conductivity, temperature
Sensors: SE 610, 2 electrodes

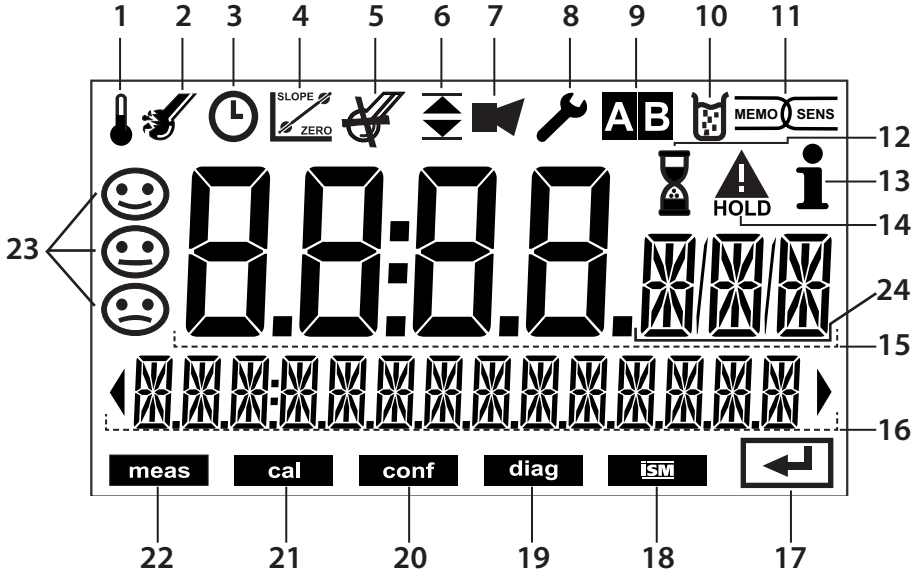


User Interface, Keypad



1 IrDA transmitter/receiver
2 Display
3 Keypad
4 Rating plate
(enclosure bottom)

Key	Function
meas	• Return to last menu level • Directly to measuring mode (press > 2 s) • Measuring mode: other display
info	• Retrieve information • Show error messages
enter	• Configuration: Confirm entries, next configuration step • Calibration: Continue program flow
menu	• Measuring mode: Call menu
Arrow keys up / down	• Menu: Increase/decrease a numeral • Menu: Selection
Arrow keys left / right	• Previous/next menu group • Number entry: Move between digits



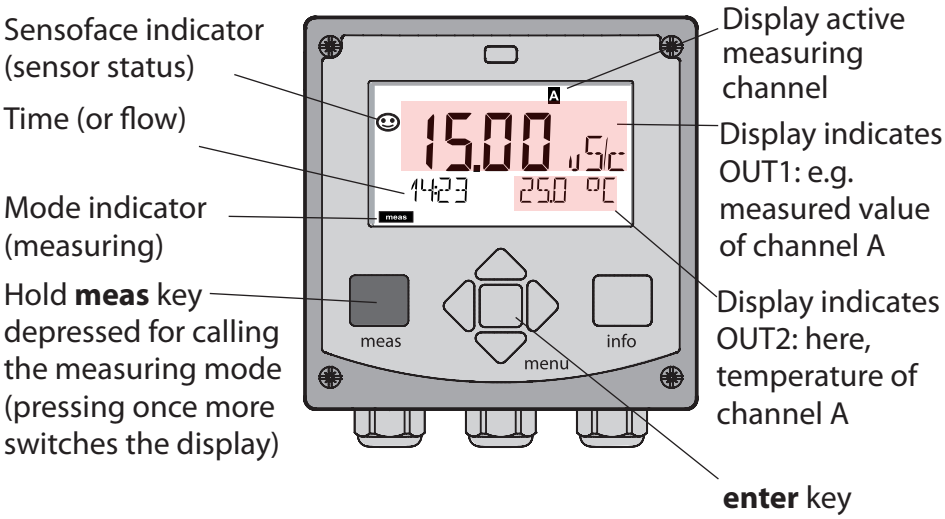
1 Temperature
2 Sensocheck
3 Interval/response time
4 Sensor data
5 Not used
6 Limit message:
Limit 1 ▼ or Limit 2 ▲
7 Alarm
8 Service
9 Channel A / Channel B
10 Calibration
11 Not used
12 Waiting time running
13 Info available
14 Hold mode active
15 Main display
16 Secondary display
17 Proceed using enter
18 Not used
19 Diagnostics
20 Configuration mode
21 Calibration mode
22 Measuring mode
23 Sensoface
24 Unit symbols

Signal colors (display backlighting, see page 25)

Red	Alarm (in case of fault: display values blink)
Red blinking	Input error: illegal value or wrong passcode
Orange	HOLD mode (Calibration, Configuration, Service)
Turquoise	Diagnostics
Green	Info
Purple	Sensoface message

Measuring Mode

After the operating voltage has been connected and the sensor identified, the analyzer automatically goes to "Measuring" mode. To call the measuring mode from another operating mode (e.g. Diagnostics, Service): Hold **meas** key depressed (> 2 s).



Depending on the configuration, one of the following displays can be set as standard display for the measuring mode (see page 24):

- Measured values channel A and channel B as well as time (default setting)
  Measured value and tag number ("TAG")
- Conductivity and temperature of channel A (see example above)
- Conductivity and temperature of channel B
- Time and date
- Measured value channel A, channel B and flow
- Output currents

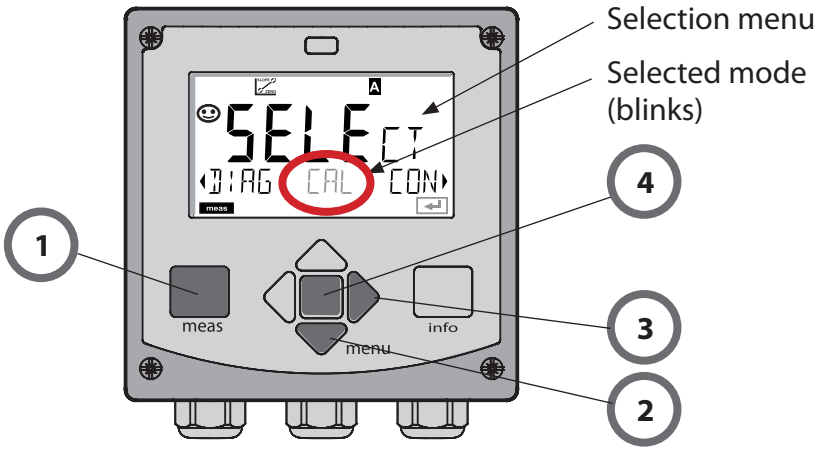
Note: By pressing the **meas** key in measuring mode you can view the displays for approx. 60 sec.

The analyzer must be configured for the respective measurement task!

Selecting the Mode / Entering Values

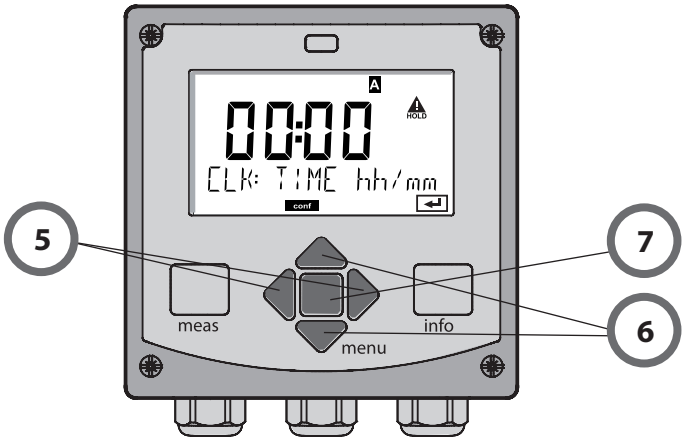
To select the operating mode:

1) Hold **meas** key depressed (> 2 s) (directly to measuring mode)
2) Press **menu** key: the selection menu appears
3) Select operating mode using left / right arrow key
4) Press **enter** to confirm the selected mode

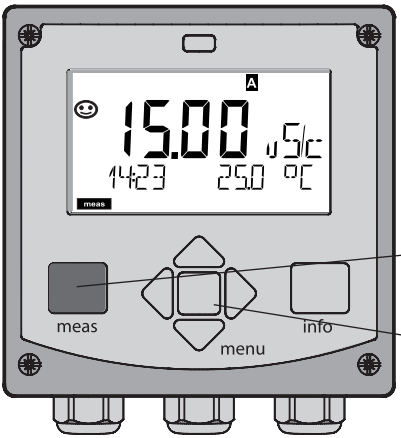


To enter a value:

5) Select numeral: left / right arrow key
6) Change numeral: up / down arrow key
7) Confirm entry by pressing **enter**



Display in Measuring Mode



The MAIN DISPLAY is the display which is shown in measuring mode. To call the measuring mode from any other mode, hold the **meas** key depressed for at least 2 sec.

meas key

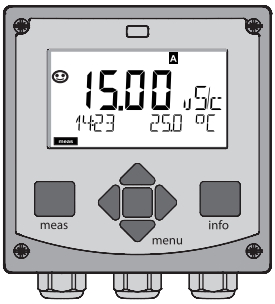
enter key

By pressing **meas** briefly you can step through further displays such as tag number (TAG) or flow (L/h). These displays are turquoise. After 60 sec they switch back to the main display.

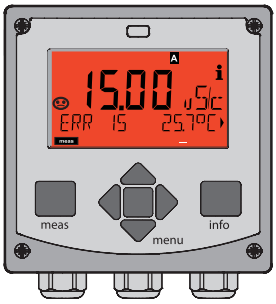
Press **enter** to select a display as MAIN DISPLAY – the secondary display shows "MAIN DISPLAY – NO". Use the **UP** / **DOWN** arrow keys to select "MAIN DISPLAY – YES" and confirm by pressing **enter**. The display color changes to white. This display is now shown in measuring mode.

Color-Coded User Interface

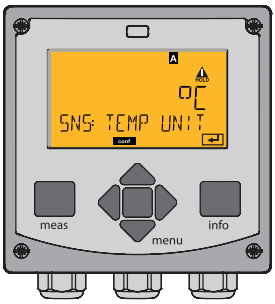
The color-coded user interface guarantees increased operating safety. Operating modes are clearly signaled.
The normal measuring mode is white. Information text appears on a green screen and the diagnostic menu appears on turquoise.
The orange HOLD mode (e.g. during calibration) is quickly visible as is the magenta screen which indicates asset management messages for predictive diagnostics – such as maintenance request, pre-alarm and sensor wear.
The alarm status has a particularly noticeable red display color and is also signaled by flashing display values. Invalid inputs or false pass-codes cause the entire display to blink red so that operating errors are noticeably reduced.



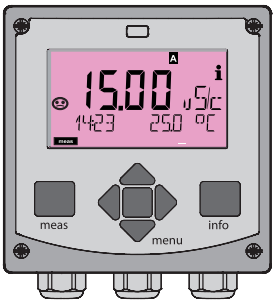
White:
Measuring mode



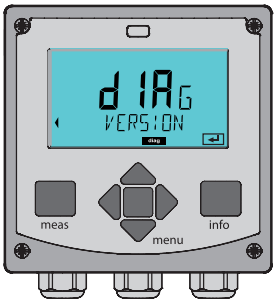
Red blinking:
Alarm, errors



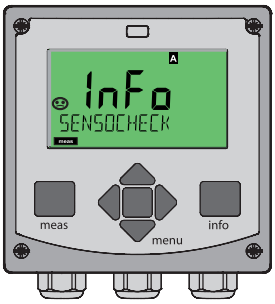
Orange:
HOLD mode



Magenta:
Maintenance request



Turquoise:
Diagnostics



Green:
Information texts

Operating Modes

Diagnostics
Display of calibration data, display of sensor data, performing a device self-test, viewing the logbook entries, display of hardware/software versions of the individual components.
The logbook can store 100 events (00...99). They can be displayed directly on the device. The logbook can be extended to 200 entries using a TAN (Option).

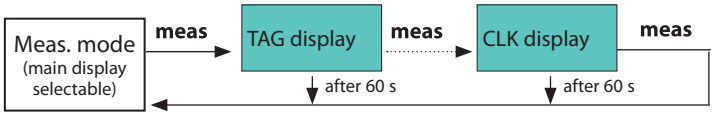
HOLD
Manual activation of HOLD mode, e.g. for servicing. The signal outputs adopt a defined state.

Calibration
There are no stable calibration solutions for the µS/cm range, and performing a calibration is very difficult because it only works properly in the flow under exclusion of air. Therefore, it is easier and more precise just to enter the cell factor or calibrate by carrying out a reference measurement, if appropriate.
During calibration the device is in HOLD mode.
During calibration the device remains in the HOLD mode until it is stopped by the operator.

Configuration
The analyzer must be configured for the respective measurement task. In the "Configuration" mode you select the connected sensor, the measuring range to be transmitted, and the conditions for warning and alarm messages. During configuration the device is in HOLD mode.
Configuration mode is automatically exited 20 minutes after the last keystroke. The device returns to measuring mode.

Service
Maintenance functions (current source), IrDA operation, passcode assignment, reset to factory settings, enabling of options (TAN).

Menu Structure of Modes and Functions



Pressing the **menu** key (down arrow) opens the selection menu.
Select the menu group using the left/right arrow keys.
Pressing **enter** opens a menu item. Press **meas** to return.

DIAG	CALDATA	Display of calibration data
	SELFTEST	Self test: RAM, ROM, EEPROM, module
	LOGBOOK	100 events with date and time
	MONITOR	Display of direct, uncorrected sensor signals
	VERSION	Display of software version, model designation, serial number
HOLD		Manual activation of HOLD mode, e.g. for sensor replacement. The signal outputs behave as configured (e.g. last measured value, 21 mA)
CAL	CAL_A	Calibrating sensor A by input of cell factor
	CAL_B	Calibrating sensor B by input of cell factor
CONF	CONF	Configuration
SERVICE (Access via code, factory setting: 5555)	MONITOR	Display of measured values for validation (simulators)
	OUT1	Current source, output 1
	OUT2	Current source, output 2
	IRDA	Activating the IrDA interface
	CODES	Specifying access codes for operating modes
	DEFAULT	Reset to factory setting
	OPTION	Enabling an option via TAN

HOLD Mode

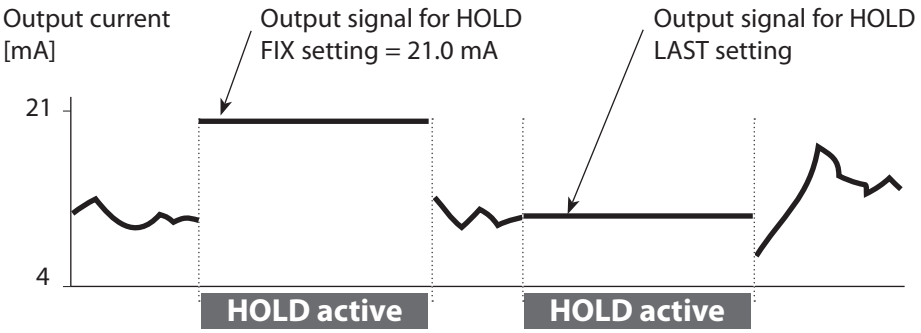
The HOLD mode is a safety mode during configuration, calibration, and servicing. Output current is frozen (LAST) or set to a fixed value (FIX).
The HOLD mode is indicated by orange display backlighting.

HOLD mode, display icon:

Output signal response

- **LAST:** The output current is frozen at its last value. Recommended for short configuration procedures. The process should not change decisively during configuration. Changes are not noticed with this setting!
- **FIX:** The output current is set to a value that is noticeably different from the process value to signal the control system that the analyzer is being worked at.

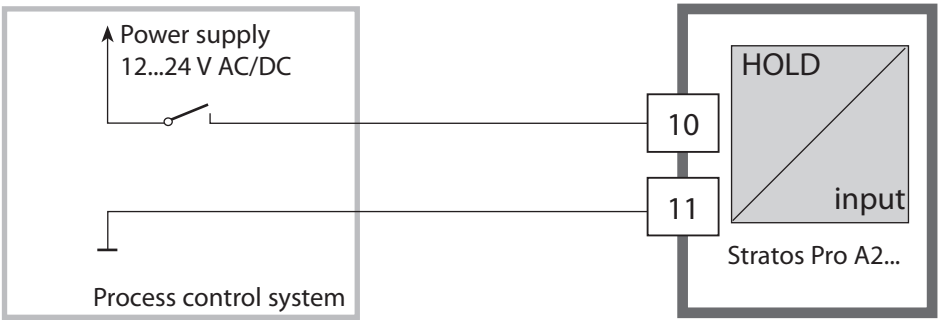
Output signal during HOLD:



Terminating the HOLD mode

The HOLD mode is ended by switching to measuring mode (hold **meas** key depressed). The display reads "Good Bye", after that, the HOLD mode is exited.
When the calibration mode is exited, a confirmation prompt ensures that the installation is ready for operation (e.g.: sensor reinstalled, located in process).

External activation of HOLD
The HOLD mode can be activated from outside by sending a signal to the Hold input (e.g. from the process control system).



HOLD inactive	0...2 V AC/DC
HOLD active	10...30 V AC/DC

Manual activation of HOLD
The HOLD mode can be activated manually from the HOLD menu. This allows checking or replacing a sensor, for example, without provoking unintended reactions of outputs or contacts.
Press **meas** key to return to selection menu.

Alarm

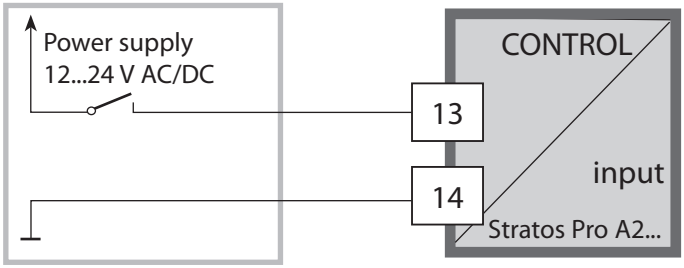
When an error has occurred, **Err xx** is displayed immediately.
Only after expiry of a user-defined delay time will the alarm be registered and entered in the logbook.
During an alarm the display blinks, the display backlighting turns **red**.

Error messages can also be signaled by a 22 mA output current (see Configuration).
2 sec after the failure event is corrected, the alarm status will be deleted.

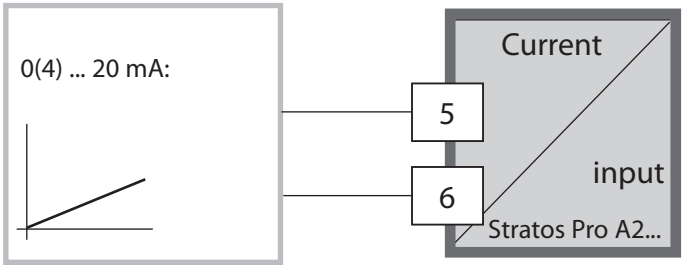
Alarm and HOLD Messages

Message	Released by	Cause
Alarm	Sensocheck	Polarization / Cable
(22 mA)	Error messages	Flow (CONTROL input)
Alarm contact opens		Flow (current input)
		ERR A / ERR B: conductance > 250,000 µS
		ERR A / ERR B: conductivity > 1,000 µS/cm
HOLD	HOLD	HOLD via menu or input
(Last/Fix)	CONF	Configuration
	CAL	Calibration
	SERVICE	Service

To generate a message via the CONTROL input:
Open the "Configuration" menu to activate the message:
CONF/CNTR_IN/CONTROL = LEVEL



To generate a message via the current input:
Open the "Configuration" menu to activate the message:
CONF / ALARM / LIMIT I-IN = ON (... FUNCTION, LEVEL; HYSTERESIS)



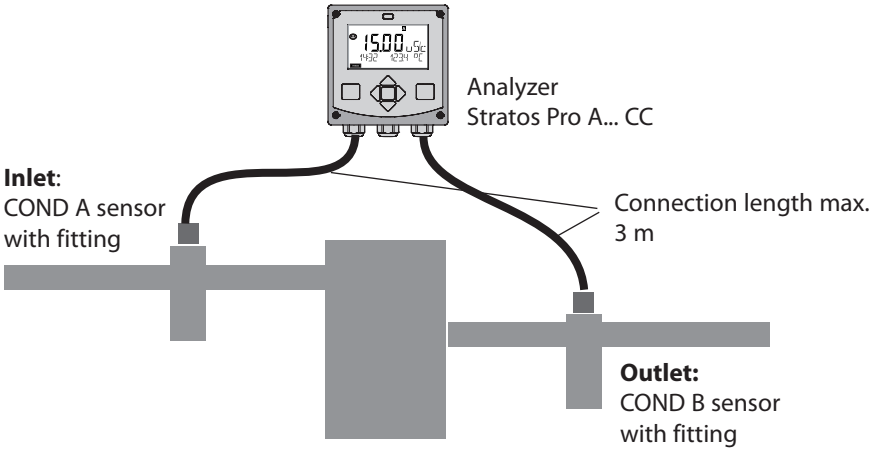
Overview of Configuration

The configuration steps are assigned to different menu groups.
Using ◂ and ▸ you can jump between the individual menu groups.
Each menu group contains menu items for setting the parameters.
Pressing **enter** opens a menu item.
Use ▲ and ▼ to edit a value. Press **enter** to confirm/save the settings.
To return to measurement: Hold **meas** key depressed (> 2 s).

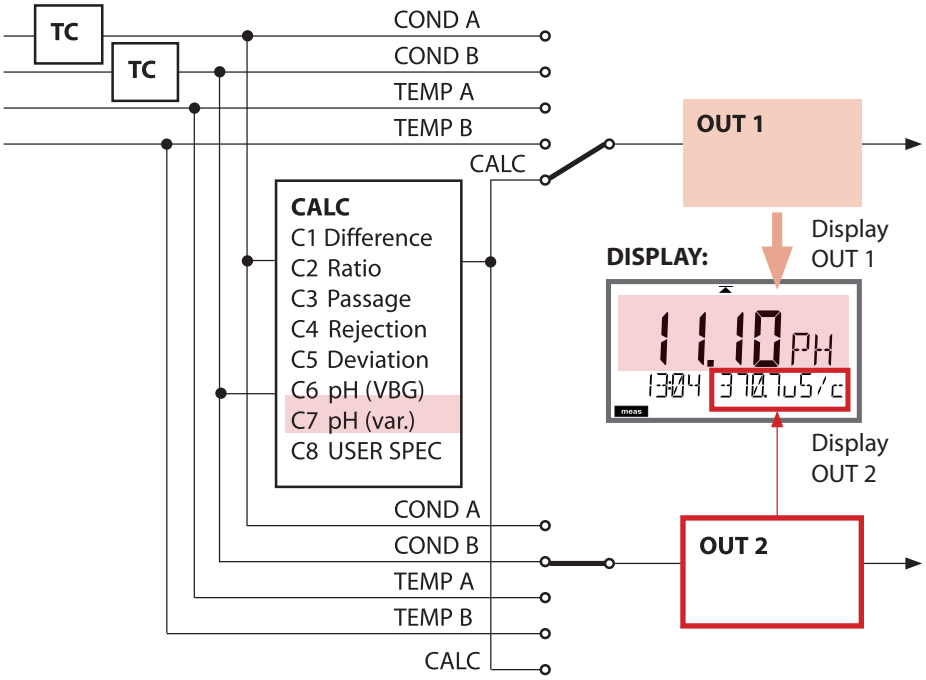
Select menu group	Menu group	Code	Display	Select menu item
	Sensor A parameters	S_A:		enter
		Menu item 1		enter
		⋮		enter
		Menu item ...		enter
	Sensor B parameters	S_B:		
	Measuring mode	MES:		
	Current output 1	OT1:		
	Current output 2	OT2:		
	Control input (flow measurement or level)	IN:		
	Alarm mode	ALA:		◂
	Setting the clock	CLK:		◂
	Tag number	TAG:		

Setup and Channel Selection on the Device

Sensors A and B – Arrangement



Channel selection and display assignment

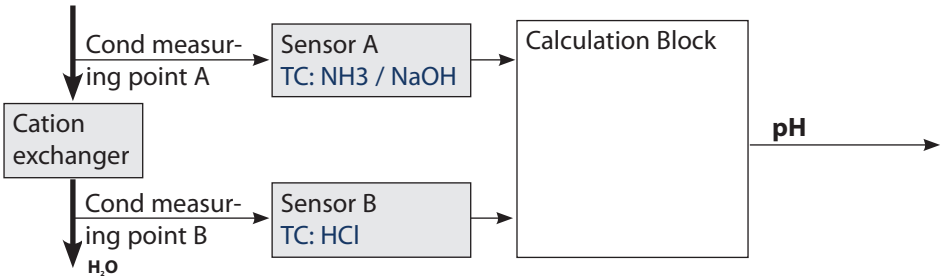


CONF	Calculation	Formula
-C1-	Difference	COND A – COND B
-C2-	Ratio	COND A / COND B
-C3-	Passage	COND B / COND A * 100
-C4-	Rejection	(COND A – COND B) / COND A * 100
-C5-	Deviation	(COND B – COND A) / COND A * 100
-C6-	pH value acc. to VBG 450	11+log((COND A – COND B /3)/243)
-C7-	Variable pH value, factors specifiable	11+log((COND A – COND B /F1)/F2) F1, F2 specifiable
-C8-	USER SPEC	PARAMETER W xxxx E-3 1000 E-3
		PARAMETER A xxx.x E-3 000.0 E-3
		PARAMETER B xxx.x E-4 000.0 E-4

pH Value Calculation

pH value calculation by means of dual conductivity measurement
When monitoring boiler feed water in power plants, the pH value can be calculated by means of a dual conductivity measurement. For that purpose, the boiler feed water conductance is measured before and after the cation exchanger. This commonly used method of indirect pH value measurement does not require much maintenance and has the following advantage: Normal pH measurement in ultrapure water is very critical. Boiler feed water does not contain many ions. This requires the use of a special electrode, which must be calibrated constantly and the service life of which is generally rather short.

Function
Two sensors are used to measure the conductivity before and after the cation exchanger. The pH value is inferred from these two conductivity values according to the calculation formulas shown below:



Calculating the concentration of sodium hydroxide solution / pH value:

$$c(NaOH) = \frac{COND\ A - 1/3\ COND\ B}{243}$$

$$pH = 11 + \log[c(NaOH)]$$

Recommended pH ranges:

10 ± 0.2 for < 136 bars operating overpressure or
9.5 ± 0.2 for > 136 bars operating overpressure

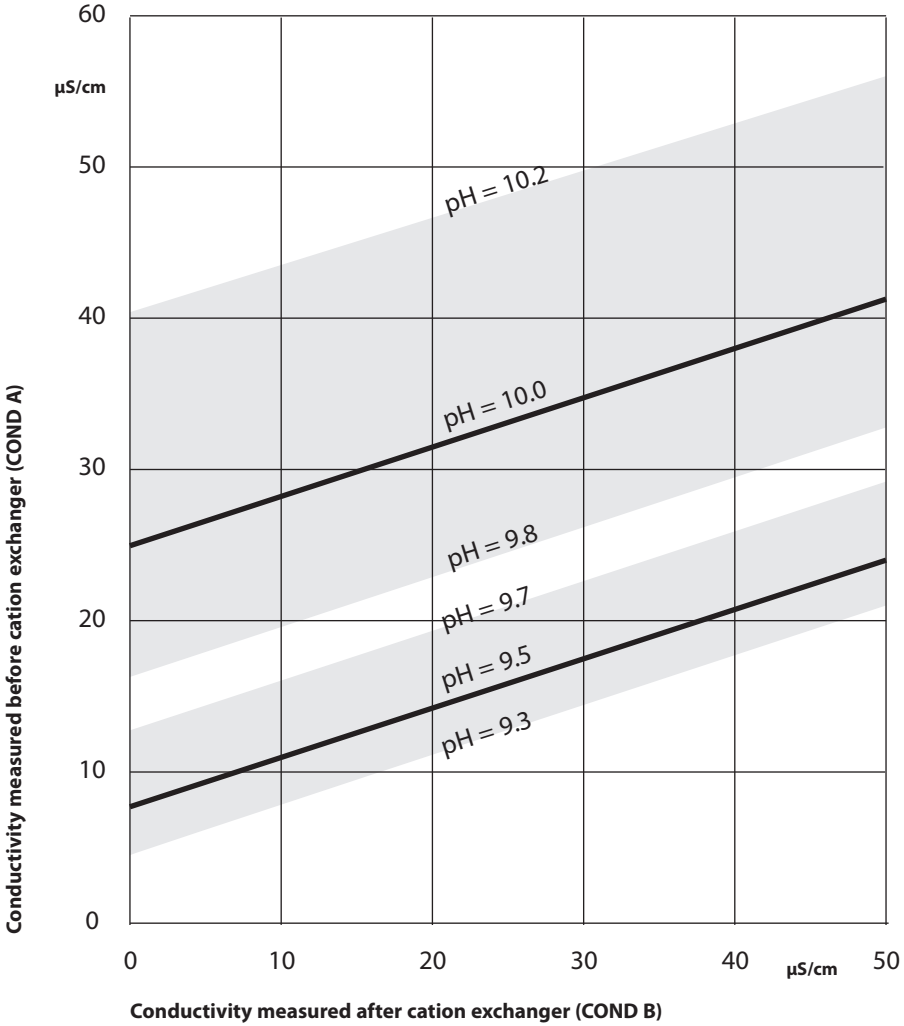


Figure:

Conditioning the feed water of natural circulation boilers with sodium hydroxide. Relationship between the pH value and the conductivity measured before and after the cation exchanger.
Source: Appendix to VGB guideline for boiler feed water, boiler water and steam of steam generators above 68 bars permissible operating overpressure (VGB-R 450 L)

Configuration			Choices	Default
SENSOR A				
S_A	CELLFACTOR A [1]		0.0050 ... 1.9999	0.0290
	TC SELECT		OFF LIN, NLF, NaCl HCl, NH3, NaOH	OFF
	LIN	TC LIQUID	00.00 ... +19.99 %/K	00.00 %/K
SENSOR B				
S_B	CELLFACTOR B [1]		0.0050 ... 1.9999	0.0290
	TC SELECT		OFF LIN, NLF, NaCl HCl, NH3, NaOH	OFF
	LIN	TC LIQUID	00.00 ... +19.99 %/K	00.00 %/K
MEAS MODE				
MEAS	MEAS RANGE [2] (this setting applies to both channels, A and B)		o.ooo µS/cm oo.oo µS/cm o.ooo µS/cm oooo µS/cm oo.oo MOhm	oo.oo µS/cm
	TEMP UNIT		°C/°F	°C
	CALCULATION		ON/OFF	OFF
	ON	(Selected in text line)	-C1- DIFFERENCE -C2- RATIO -C3- PASSAGE -C4- REJECTION -C5- DEVIATION -C6- PH-VGB -C7- PH-VARIABLE -C8- USER SPEC	-C1- DIFFERENCE
	-C7-	FACTOR 1	01.00 ... 10.00	03.00
		FACTOR 2	0100 ... 0500	0243
	-C8-	PARAMETER W	xxxx E-3	1000 E-3
		PARAMETER A	xxx.x E-3	000.0 E-3
		PARAMETER B	xxx.x E-4	000.0 E-4

1) The cell factor can be modified by an entry in the configuration menu or by calibration (one storage position). This means, a cell factor determined by calibration is taken over by pressing **enter** during configuration. It remains unchanged until a new value is entered.

2) For conductivity (µS/cm), the range selection determines the max. resolution. If the selected range is exceeded, the device automatically switches to the next higher range until the max. measurement limit is reached (9999 µS/cm).
This applies to display values and current outputs. The current outputs are adjusted using a floating-point editor which allows settings over several decades. The initial range of the editor is the selected range:

Selected resolution	Displayed range (or floating-point editor)			
	x.xxx µS/cm	xx.xx µS/cm	x.xxx µS/cm	xxxx µS/cm
x.xxx µS/cm				
xx.xx µS/cm				
xxx.x µS/cm				
xxxx µS/cm				

Configuration			Choices	Default
Output 1 (OUT1)				
OT1:	CHANNEL		COND A COND B TMP A TMP B CALC	COND A
	OUTPUT		LIN / BiLIN	LIN
	LIN	BEGIN (0) 4 mA	oo.oo µS/cm	00.00 µS/cm
		END 20 mA	oo.oo µS/cm	10.00 µS/cm
	BiLIN	BEGIN (0) 4 mA		
		END 20 mA		
		CORNER X	Input range: selected CHANNEL Vertex X : BEGIN ≤ CORNER X ≤ END (rising) BEGIN ≥ CORNER X ≥ END (falling)	
		CORNER Y	Input range: selected CHANNEL Default: 12 mA Vertex Y: (0) 4 mA ≤ CORNER Y ≤ 20 mA	
	TMP °C	BEGIN (0) 4 mA	–50...200 °C	
		END 20 mA	–50...200 °C	
	TMP °F	BEGIN (0) 4 mA	–58...392 °F	
		END 20 mA	–58...392 °F	
	FILTERTIME		0...120 SEC	0000 SEC
	22mA-FAIL		ON/OFF	OFF
	HOLD MODE		LAST/FIX	LAST
	FIX	HOLD-FIX	4...22 mA	021.0 mA
Output 2 (OUT2)				
OT2:	CHANNEL		Selection as for OUT1	COND B
	All following settings are made as for output 1 (OUT1)			

Control input (CNTR_IN)				
IN:	CONTROL		LEVEL, FLOW	FLOW
	FLOW	FLOW ADJUST	12000 pulses/liter	0 ... 20000 pulses/liter
Alarm (ALARM)				
ALA:	DELAYTIME		0...600 SEC	0010 SEC
	SENSOCHECK		ON/OFF	OFF
	FLOW CNTR *)		ON/OFF	OFF
	ON	FLOW MIN ***)	005.0 L/h	0 ... 99.9 L/h
		FLOW MAX***)	025.0 L/h	0 ... 99.9 L/h
	LIMIT I-IN *) **)		ON/OFF	OFF
	ON	FUNCTION	Lo LEVL / Hi LEVL	Lo LEVL
		LEVEL	0 ... 22.00 mA	12.00 mA
		HYSTERESIS	0 ... 10.00 mA	01.00 mA

*) These menu items appear only if selected.

**) LIMIT I-IN can be used to measure and monitor the current input (e.g. flow). For monitoring, you can enter a setpoint at which an alarm message is released: "ERR 71 LIMIT I-INPUT" (22 mA).

***) Hysteresis fixed at 5% of threshold value

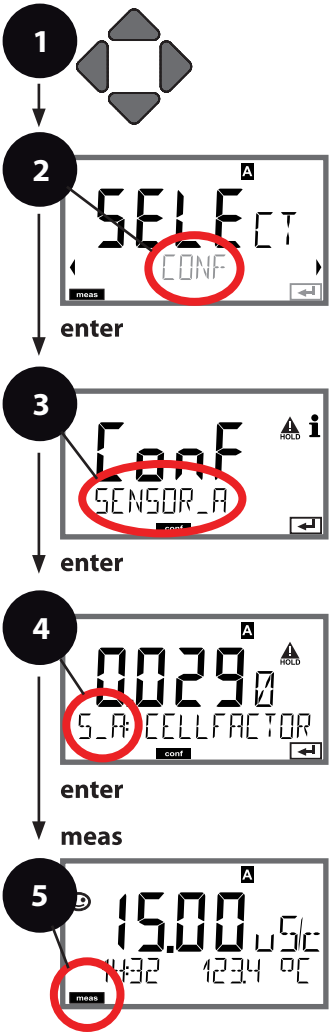
Configuration			Choices	Default
Real-time clock (CLOCK)				
CLK:	FORMAT		24 h / 12 h	
	24 h	TIME hh/mm	00..23:00...59	
	12 h	TIME hh/mm	00...11:00...59 AM/PM:	
	DAY/MONTH		01...31/01...12	
	YEAR		2000...2099	
Tag number (TAG)				
TAG:	(Input in text line, max. 32 digits)			___

Configuration (Original for Copy)

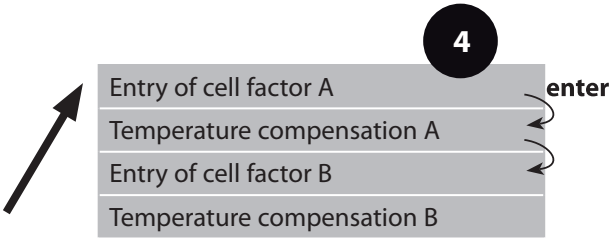
Parameter	Setting
S_A: Cell factor A	
S_A: Temperature compensation A	
S_B: Cell factor B	
S_B: Temperature compensation B	
MEAS: Measuring range	
MEAS: Temperature unit	
MEAS: Calculation	
MEAS: Factor 1 (for variable pH only, -C7-)	
MEAS: Factor 2 (for variable pH only, -C7-)	
MEAS: Parameter W (for USER SPEC only, -C8-)	
MEAS: Parameter A (for USER SPEC only, -C8-)	
MEAS: Parameter B (for USER SPEC only, -C8-)	
OT1: Parameter (channel)	
OT1: Linear / Bilinear curve	
OT1: Current start	
OT1: Current end	
OT1: (Bilinear curve only) vertex X	
OT1: (Bilinear curve only) vertex Y	
OT1: Filter time	
OT1: 22 mA error current	
OT1: HOLD mode	
OT1: HOLD-FIX current	
OT2: Parameter (CHANNEL)	
OT2: Linear / Bilinear curve	
OT2: Current start	
OT2: Current end	
OT2: (Bilinear curve only) vertex X	
OT2: (Bilinear curve only) vertex Y	
OT2: Filter time	
OT2: 22 mA error current	
OT2: HOLD mode	
OT2: HOLD-FIX current	
IN: Level or flow	
IN: (Flow meter) Adjusting pulses/liter	

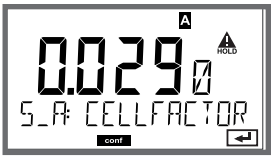
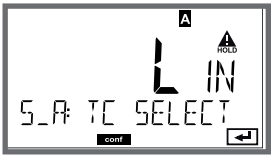
Parameter	Setting
ALA: Delay	
ALA: Sensocheck on/off	
ALA: Flow control FLOW CNTR on/off	
ALA: Minimum flow (hysteresis fixed at 5 %)	
ALA: Maximum flow (hysteresis fixed at 5 %)	
ALA: Monitoring of current input LIMIT I-IN on/off	
ALA: FUNCTION (LO LEVEL / Hi LEVEL)	
ALA: LEVEL (monitored threshold)	
ALA: HYSTERESIS	
CLK: Time & Date	
TAG: Tag number	

Configuring Sensors A, B
Specifying cell factor, selecting temperature compensation

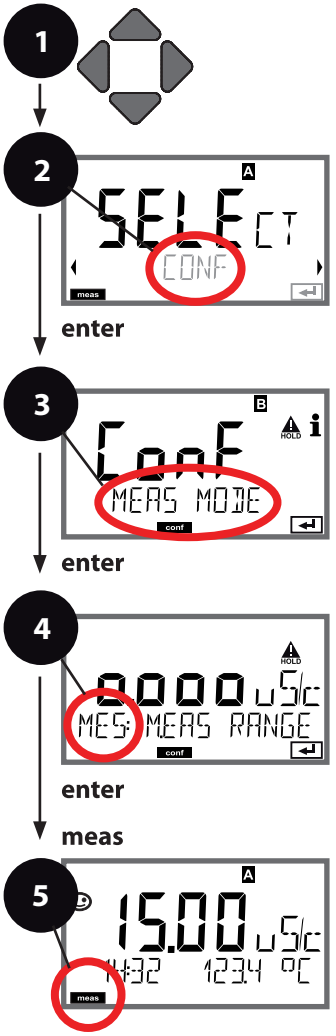


1) Press **menu** key.
2) Select **CONF** using ◂ ▸ keys, press **enter**.
3) Select **SENSOR_A** menu using ◂ ▸ keys, press **enter**.
4) All items of this menu group are indicated by the "S_A:" code.
   Press **enter** to select menu, edit using arrow keys (see next page).
   Confirm (and proceed) using **enter**.
5) End: Press **meas** key until the [meas] mode indicator is displayed.



Menu item	Action	Choices
Sensor A 	Select **SENSOR_A** menu using ◂ ▸ keys, press **enter**.	
Enter cell factor Sensor A 	Modify digit using ▲ ▼ keys, select next digit using ◂ ▸ keys. Press **enter** to confirm.	0.0050...1.9999 **(0.0290)**
Temp compensation selection 	Select using ▲ ▼ keys. Press **enter** to confirm.	**OFF** LIN* NLF NaCl HCl NH3 NaOH * With LIN selected: Enter temperature coefficient **00.00 %/K** ... +19.99 %/K
Sensor B 	Select **SENSOR_B** menu using ◂ ▸ keys, press **enter**.	
Enter cell factor Sensor B...	Configuration as for sensor A	

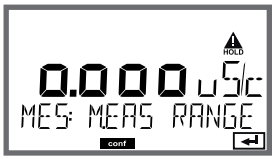
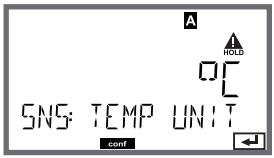
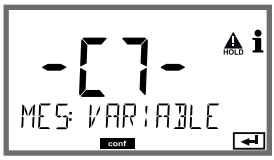
Measuring Range, Calculation of Output Parameters



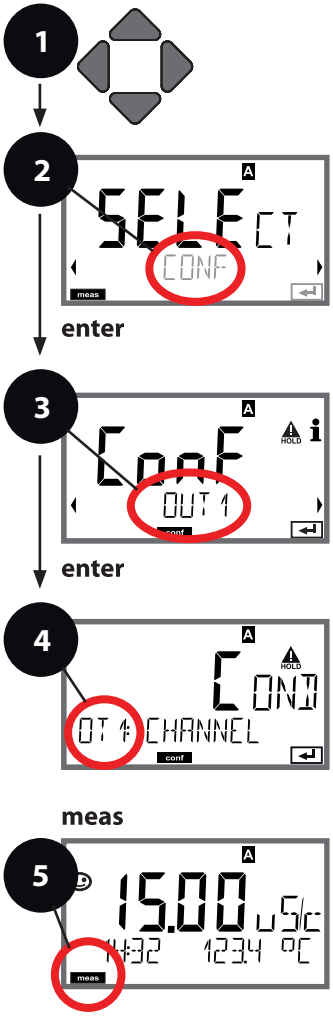
1) Press **menu** key.
2) Select **CONF** using ◂ ▸ keys, press **enter**.
3) Select **MEAS MODE** menu using ◂ ▸ keys, press **enter**.
4) All items of this menu group are indicated by the "MES:" code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) using **enter**.
5) End: Press **meas** key until the [meas] mode indicator is displayed.

4

Range (resolution)	enter
Temperature unit	
Calculations	
Parameter (for -C7- variable pH or -C8-)	

Menu item	Action	Choices
Range (resolution) 	Select using ▲ ▼ keys. Press **enter** to confirm.	o.ooo µS/cm **oo.oo µS/cm** ooo.o µS/cm oooo µS/cm oo.oo MOhm
Temperature unit 	Select °C or °F using ▲ ▼ keys. Press **enter** to confirm.	**°C** / °F
Calculation 	Select using ▲ ▼ keys. Press **enter** to confirm.	ON, **OFF**
Calculation type 	Select desired calculation type using ▲ ▼ keys: Press **enter** to confirm.	**-C1-** DIFFERENCE -C2- RATIO -C3- PASSAGE -C4- REJECTION -C5- DEVIATION -C6- PH-VGB -C7- PH-VARIABLE -C8- USER SPEC
	With -C7- variable pH or -C8- USER SPEC selected, you are requested to enter parameters.	-C7- Factor 1: **03.00** (01.00 ... 10.00) -C7- Factor 2: **0243** (0100 ... 0500) -C8- Parameter W: (xxxx E-3 1000 E-3) -C8- Parameter A: (xxx.x E-3 000.0 E-3) -C8- Parameter B: (xxx.x E-4 000.0 E-4)

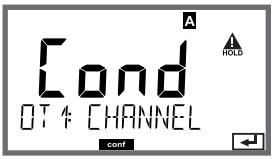
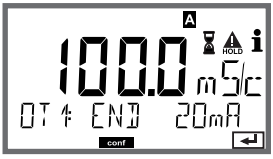
Current Output 1
Process variable. Current start. Current end.



1) Press **menu** key.
2) Select **CONF** using ◂ ▸ keys, press **enter**.
3) Select **OUT1** menu using ◂ ▸ keys, press **enter**.
4) All items of this menu group are indicated by the "OT1:" code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) using **enter**.
5) End: Press **meas** key until the [meas] mode indicator is displayed.

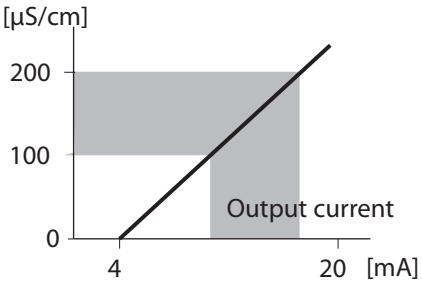
4

CHANNEL: Channel selection (process variable) — enter
OUTPUT: LIN: linear curve biLIN: bilinear curve
Current start
Current end
Bilinear: vertex X
Bilinear: vertex Y
Time averaging filter
Output current during error message
Output current during HOLD
Output current for HOLD FIX

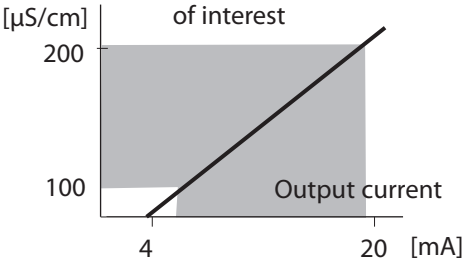
Menu item	Action	Choices
Process variable 	Select using ▲ ▼ keys: Cond: Conductivity TMP: Temperature CALC: Calculation Press **enter** to confirm.	**Cond A** Cond B TMP A TMP B CALC
Current start 	Modify digit using ▲ ▼ keys, select next digit using ◀ ▶ keys. Press **enter** to confirm.	As selected for process variable/range If the adjusted range is exceeded, the device automatically switches to the next higher range (Autorange)
Current end 	Enter value using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	As selected for process variable/range If the adjusted range is exceeded, the device automatically switches to the next higher range (Autorange)

Assignment of measured values: Current start and current end

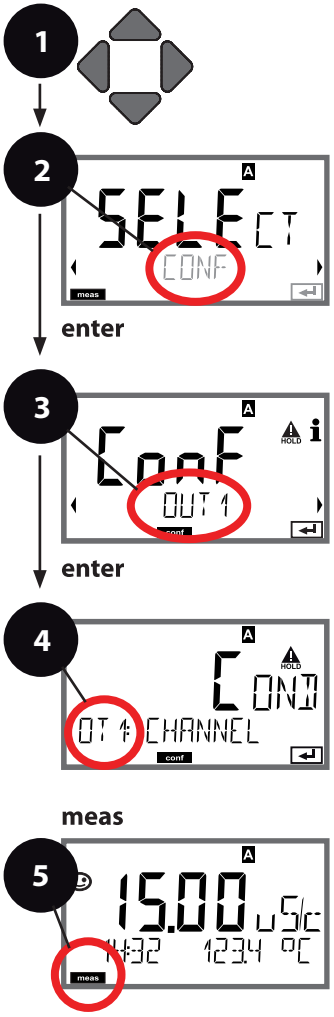
Example 1: Range 0...200 µS/cm



Example 2: Range 100...200 µS/cm
Advantage: Higher resolution in range of interest



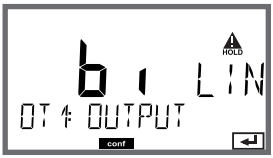
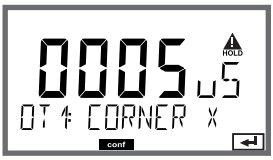
Current Output 1
Output current curve



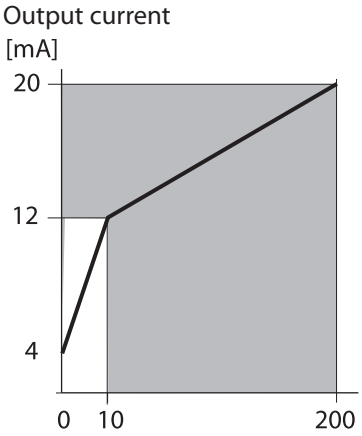
1) Press **menu** key.
2) Select **CONF** using ◂ ▸ keys, press **enter**.
3) Select **OUT1** menu using ◂ ▸ keys, press **enter**.
4) All items of this menu group are indicated by the "OT1:" code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) using **enter**.
5) End: Press **meas** key until the [meas] mode indicator is displayed.

4

CHANNEL: Channel selection (process variable) — enter
OUTPUT: LIN: linear curve biLIN: bilinear curve
Current start
Current end
Bilinear: vertex X
Bilinear: vertex Y
Time averaging filter
Output current during error message
Output current during HOLD
Output current for HOLD FIX

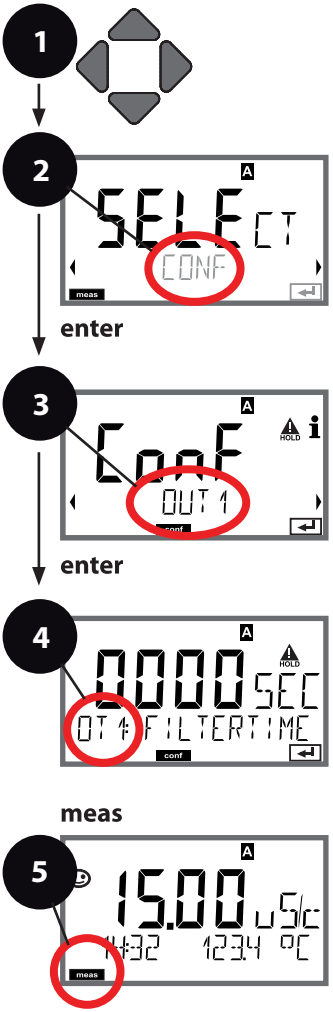
Menu item	Action	Choices
Output current curve 	Select using ▲ ▼ keys. Press **enter** to confirm.	**LIN** Linear curve biLIN Bilinear curve
Current start and current end 	Enter value using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	Entered value applies to selected process variable/ range If the adjusted range is exceeded, the device automatically switches to the next higher range (Autorange)
Bilinear curve: Vertex X/Y 	Enter value using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	Entered value applies to selected vertex of bilinear curve "Corner X" (process variable) and "Corner Y (output current) – see figure below.

Vertex of bilinear curve



Example:
Current range set to 4 ... 20 mA,
Current start: 0 µS/cm
Current end: 200 µS/cm
Vertex:
"CORNER X": 10 µS/cm (process variable)
"CORNER Y": 12 mA (output current)
Result: The output current change in the range 0 ... 10 µS/cm is much greater than in the range 10 ... 200 µS/cm.

Current Output 1
Adjusting time interval of output filter

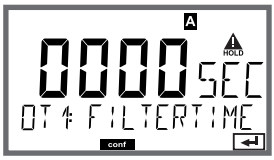


1) Press **menu** key.
2) Select **CONF** using ◂ ▸ keys, press **enter**.
3) Select **OUT1** menu using ◂ ▸ keys, press **enter**.
4) All items of this menu group are indicated by the "OT1:" code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) using **enter**.
5) End: Press **meas** key until the [meas] mode indicator is displayed.

4

CHANNEL: Channel selection (process variable)
OUTPUT: LIN: linear curve biLIN: bilinear curve
Current start
Current end
Bilinear: vertex X
Bilinear: vertex Y
Time averaging filter
Output current during error message
Output current during HOLD
Output current for HOLD FIX

enter

Menu item	Action	Choices
Time averaging filter 	Enter value using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0...120 SEC (**0000 SEC**)

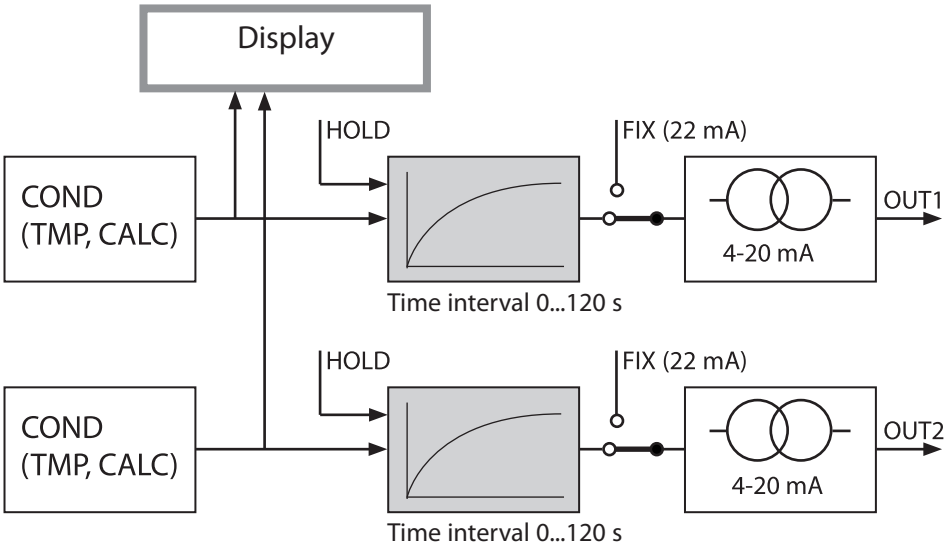
Time averaging filter

To smoothen the current output, a low-pass filter with adjustable filter time constant can be switched on. When there is a jump at the input (100 %), the output level is at 63 % after the time interval has been reached. The time interval can be set from 0 to 120 sec. If the time interval is set to 0 sec, the current output directly follows the input.

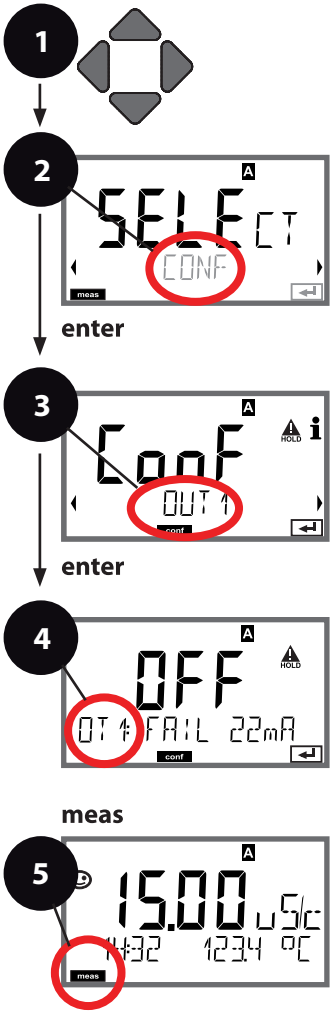
Please note:

The filter only acts on the current output, not on the display or the limit value!

During HOLD the filter is not applied. This prevents a jump at the output.



Current Output 1
Output current during Error and HOLD

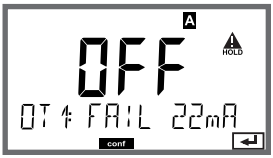
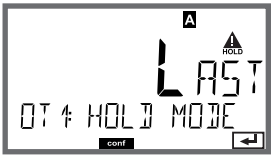


1) Press **menu** key.
2) Select **CONF** using ◂ ▸ keys, press **enter**.
3) Select **OUT1** menu using ◂ ▸ keys, press **enter**.
4) All items of this menu group are indicated by the "OT1:" code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) using **enter**.
5) End: Press **meas** key until the [meas] mode indicator is displayed.

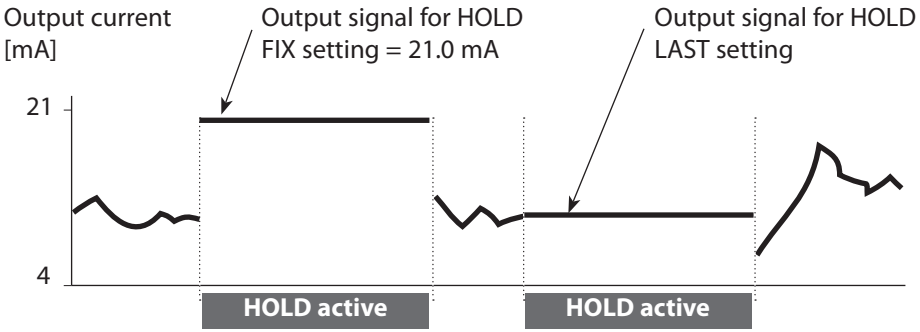
4

CHANNEL: Channel selection (process variable)
OUTPUT: LIN: linear curve biLIN: bilinear curve
Current start
Current end
Bilinear: vertex X
Bilinear: vertex Y
Time averaging filter
Output current during error message
Output current during HOLD
Output current for HOLD FIX

enter

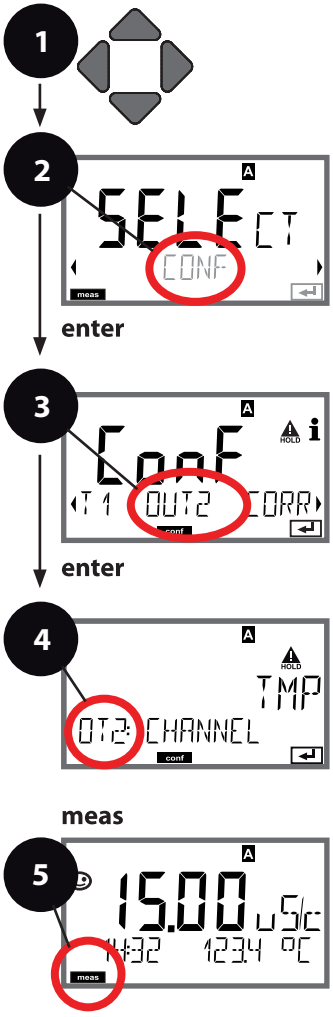
Menu item	Action	Choices
Output current during error message 	Select ON or OFF using ▲ ▼ keys. Press **enter** to confirm.	ON/**OFF**
Output current during HOLD 	LAST: During HOLD the last measured value is maintained at the output. FIX: During HOLD a value (to be entered) is maintained at the output. Select using ▲ ▼ Press **enter** to confirm.	**LAST**/FIX
Output current for HOLD FIX 	Only with FIX selected: Enter current which is to flow at the output during HOLD Enter value using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	04.00...22.00 mA (**21.00 mA**)

Output signal during HOLD:



Current Output 2

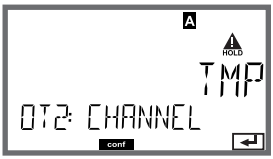
Output current range. Process variable.



1) Press **menu** key.
2) Select **CONF** using ◂ ▸ keys, press **enter**.
3) Select **OUT2** menu using ◂ ▸ keys, press **enter**.
4) All items of this menu group are indicated by the "OT2:" code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) using **enter**.
5) End: Press **meas** key until the [meas] mode indicator is displayed.

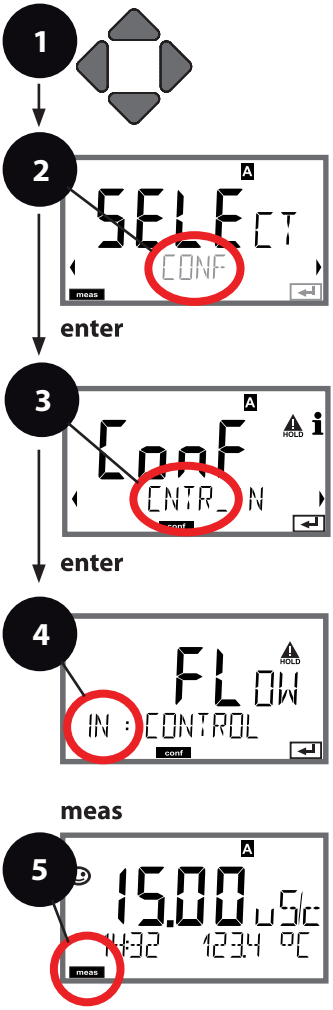
4

CHANNEL: Channel selection (process variable) — enter
OUTPUT: LIN: linear curve biLIN: bilinear curve
Current start
Current end
Bilinear: vertex X
Bilinear: vertex Y
Time averaging filter
Output current during error message
Output current during HOLD
Output current for HOLD FIX

Menu item	Action	Choices
Process variable 	Select using ▲ ▼ keys: Cond: Conductivity TMP: Temperature Press **enter** to confirm.	Cond A Cond B **TMP A** TMP B CALC
. . .		

All the following adjustments are made as for current output 1 (see there)!

CONTROL input
Flow measurement



1) Press **menu** key.
2) Select **CONF** using ◂ ▸ keys, press **enter**.
3) Select **CNTR_IN** menu using ◂ ▸ keys, press **enter**.
4) All items of this menu group are indicated by the "IN:" code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) using **enter**.
5) End: Press **meas** key until the [meas] mode indicator is displayed.

→ CONTROL input

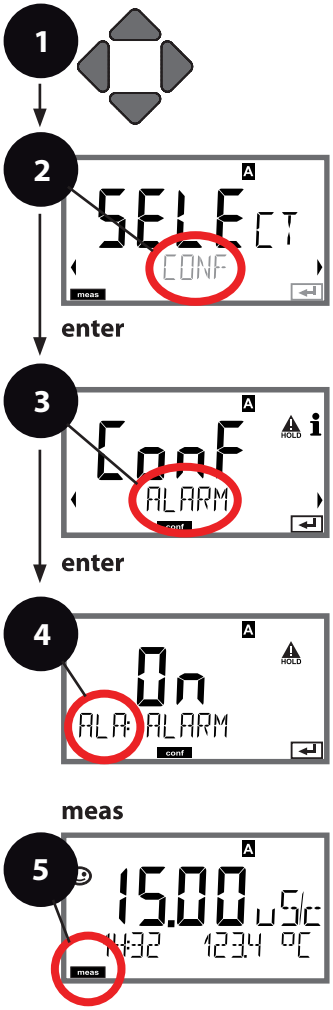
Menu item	Action	Choices
Select function of CONTROL input	Select using ▲ ▼ keys. Press **enter** to confirm.	**Level** Flow (for connecting a pulse-output flow meter)
Adjust to flow meter	**With "Flow" selected**, you must adjust the device to the flow meter used. Enter value using arrow keys. Press **enter** to confirm.	**12000 pulses/liter**

In the alarm menu you can configure flow monitoring. When you have set CONTROL to FLOW, you can specify 2 additional limit values for maximum and minimum flow.
If the measured value lies outside this range, an alarm message and a 22-mA error signal (if configured) will be generated.

Display
Flow measurement in measuring mode

Display
Flow measurement (sensor monitor)

Alarm Settings
Delay. Sensocheck.

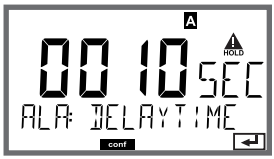
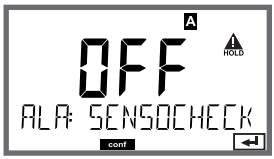
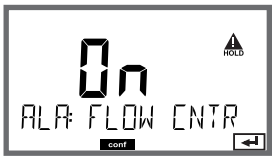
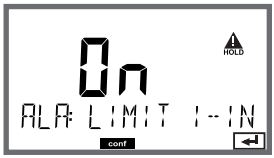


1) Press **menu** key.
2) Select **CONF** using ◂ ▸ keys, press **enter**.
3) Select **ALARM** menu using ◂ ▸ keys, press **enter**.
4) All items of this menu group are indicated by the "ALA:" code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) using **enter**.
5) End: Press **meas** key until the [meas] mode indicator is displayed.

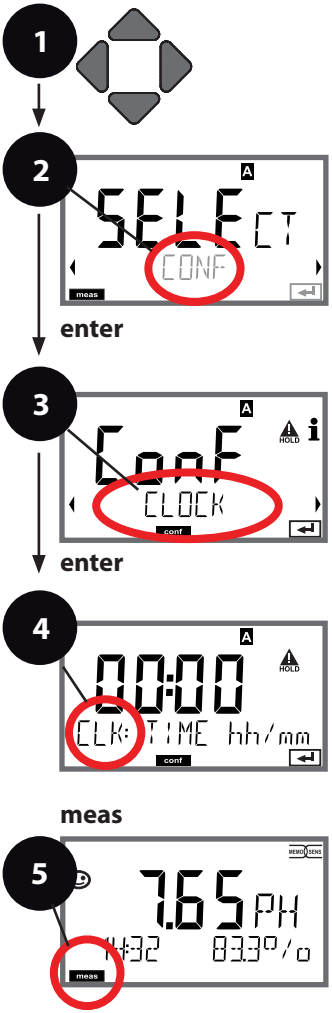
4

ALARM: Delay
Alarm: Sensocheck Alarm: CONTROL input
For flow monitoring: Max. flow alarm
For flow monitoring: Min. flow alarm

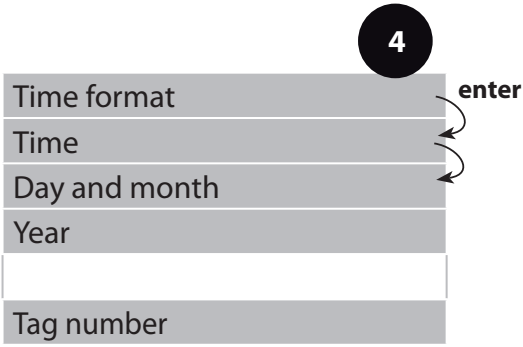
Error messages can be signaled by a 22 mA output current (see Error Messages and Configuration of Output 1/Output 2).
The alarm delay time delays the color change of the display back-lighting to red and the 22 mA signal (if configured).

Menu item	Action	Choices
Delay 	Enter value using ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.	0...600 SEC (**010 SEC**)
Sensocheck 	Select Sensocheck (continuous monitoring of sensor). Select ON or OFF using ▲ ▼ keys. Press **enter** to confirm.	ON/**OFF**
CONTROL input 	The **CONTROL input** can generate an alarm depending on its assignment in the CONF menu: **FLOW (flow measurement):** allows monitoring the minimum and maximum flow (pulse counter) **LEVEL (control input)**: Level monitoring.	ON/**OFF** (FLOW MIN, FLOW MAX.)
Current input 	**LIMIT I-IN** Monitoring a flow meter (4 ... 20 mA) for a limit value, either MIN (Lo LEVEL) or MAX (Hi LEVEL). Press **enter** to confirm.	**Lo LEVL** / Hi LEVL
LEVEL	Threshold value	0 ... 22.00 mA **(12.00 mA)**
HYSTERESIS	Hysteresis	0 ... 10.00 mA **(01.00 mA)**

Time and Date
Tag Number



1) Press **menu** key.
2) Select **CONF** using ◂ ▸ keys, press **enter**.
3) Select **CLOCK** or **TAG** using ◂ ▸ keys, press **enter**.
4) All items of this menu group are indicated by the "CLK:" or "TAG" code.
   Press **enter** to select menu,
   edit using arrow keys (see next page).
   Confirm (and proceed) by pressing **enter**.
5) End: Press **meas** key until the [meas] mode indicator is displayed.



Time and Date

In measuring mode the time is shown in the lower display.
In addition, the logbook entries (cf Diagnostics) are provided with a time stamp.

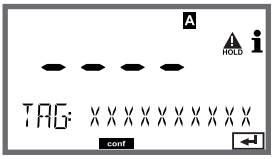
Please note:

- After prolonged power outage (> 5 days) the time display is replaced by dashes and cannot be used for processing.
  Enter the correct time.
- There is no automatic switchover from winter to summer time!
  Be sure to manually adjust the time!

Tag Number (" TAG")

You can enter a designation for the point of measurement (tag number) in the lower display line. Up to 32 digits are possible.
Pressing **meas** (repeatedly) in the measuring mode indicates the tag number.
Being part of the device configuration, the "TAG" can be read out via IrDA. A standardized tag number helps, for example, to correctly re-install a device after repair.

4

Menu item	Action	Choices
Tag number 	Select character using ▲ ▼ keys, select next digit using ◀ ▶ keys. Press **enter** to confirm.	A...Z, 0...9, – + < > ? / @ The first 10 characters are seen in the display without scrolling.

Calibration

Please note:

- All calibration procedures must be performed by trained personnel. Incorrectly set parameters may go unnoticed, but change the measuring properties.

Each sensor is calibrated separately by entering the cell factor.

Calibration by Input of Cell Factor

You can directly enter the value for the cell factor of a sensor. This value must be known, e.g. determined beforehand in the laboratory. The selected process variable and the temperature are displayed.

Display	Action	Remark
	Select Calibration. Press **enter** to proceed. Select CAL_CELL_A (or CAL_CELL_B) calibration method. Press **enter** to proceed.	The calibration procedure is identical for sensor A and sensor B. The selection (A or B) is indicated in the upper display line.
	Ready for calibration. Hourglass blinks.	Display (3 sec) Now the device is in HOLD mode.
	Enter cell factor. Press **enter** to proceed.	The selected process variable and the temperature are displayed.
	The device shows the calculated cell factor (at 25 °C). Sensoface is active.	
	Use the arrow keys to select: • MEAS (end) • REPEAT Press **enter** to proceed.	End: HOLD is deactivated after a short time.

Measurement

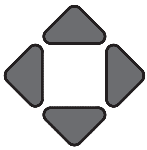
Display	Remark
	From the configuration or calibration menus, you can switch the device to measuring mode by pressing the **meas** key (> 2 sec). In the measuring mode the main display shows the configured process variable, the secondary display shows the time and the second configured process variable. The [meas] mode indicator lights. **Please note:** • After prolonged power outage (> 5 days) the time display is replaced by dashes and cannot be used for processing. In that case, enter the correct time.
By pressing the **meas** key you can step through the displays listed below. When no key has been pressed for 60 sec, the device returns to the display which has been selected as MAIN DISPLAY.	
Depending on the configuration, one of the following displays can be set as standard display for the measuring mode (MAIN DISPLAY, see "Color-Coded User Interface" on page 25): 1) Display of tag number ("TAG") with up to 32 digits 2) Conductivity and temperature of channel A 3) Conductivity and temperature of channel B 4) Display of time and date 5) Measured values of channel A, channel B and flow 6) Output currents	

In the Diagnostics mode you can access the following menus without interrupting the measurement:

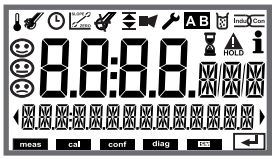
CALDATA	Viewing the calibration data
SELFTEST	Starting a device self-test
LOGBOOK	Viewing the logbook entries
MONITOR	Displaying currently measured values
VERSION	Displaying device type, software version, serial number

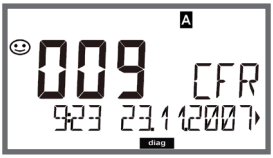
Access to diagnostics can be protected with a passcode (SERVICE menu).

Please note:
HOLD is not active during Diagnostics mode!

Action	Key	Remark
Activate diagnostics		Pressing the **menu** key (down arrow) opens the selection menu. (Display color changes to turquoise.) Select DIAG using ◂ ▸ keys, press **enter** to confirm.
Select diagnostics option		Use ◂ ▸ keys to select from: CALDATA SELFTEST LOGBOOK MONITOR VERSION See next pages for further proceeding.
Exit	**meas**	Exit by pressing **meas**.

Menu item	Remark
	Display of calibration data Select CALDATA using ◂ ▸, press **enter** to confirm. Use the ◂ ▸ keys to select the desired parameter from the bottom line of the display (LAST CAL CELL_A CELL_B). The selected parameter is shown in the main display. Press **meas** to return to measurement.

Display	Menu item
	**Device self-test** (To abort, you can press **meas**.) 1) **Display test**: Display of all segments with changing background colors white/green/red. Proceed by pressing **enter**.
	2) **RAM test:** Hourglass blinks, then display of --PASS-- or --FAIL-- Proceed by pressing **enter**.
	3) **EEPROM test:** Hourglass blinks, then display of --PASS-- or --FAIL-- Proceed by pressing **enter**.
	4) **FLASH test:** Hourglass blinks, then display of --PASS-- or --FAIL-- Proceed by pressing **enter**.
	5) **Module test:** Hourglass blinks, then display of --PASS-- or --FAIL-- Press **enter** or **meas** to return to measuring mode.

Menu item	Remark
   	Display of logbook entries. Select LOGBOOK using ◀ ▶, press **enter** to confirm. Using the ▲ ▼ keys, you can scroll backwards and forwards through the logbook (entries -00-...-99-), -00- being the last entry. If the display is set to date/time, you can search for a particular date using the ▲ ▼ keys. Press ◀ ▶ to view the corresponding message text. If the display is set to the message text, you can search for a particular message using the ▲ ▼ keys. Press ◀ ▶ to display the date and time. Press **meas** to return to measurement.
	**Extended logbook / Audit Trail (via TAN)** With the ▲ ▼ keys, you can scroll backwards and forwards through the extended logbook (entries -000-...-199-), -000- being the last entry. **Display: CFR** Audit Trail also records function activations (CAL CONFIG SERVICE), some Sensoface messages and opening of the enclosure.
 Display example: 	**Display of currently measured values (sensor monitor):** Select MONITOR using ◀ ▶, press **enter** to confirm. Use the ◀ ▶ keys to select the desired parameter from the bottom line of the display: R_COND_A, R_COND_B, G_COND_A, G_COND_B (all these apply to cell factor = 1), RTD_A, RTD_B, TEMP_A, TEMP_B, I-INPUT (Option). The selected parameter is shown in the main display. Press **meas** to return to measurement.

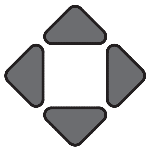
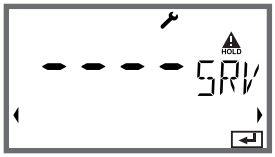
Display	Remark
	Version Here, you find the data you require for requesting a device-specific option. Use the ▲ ▼ keys to switch between software and hardware version. Press **enter** to proceed to next device component.
	Display of **device type** and **serial number** of device. Use the ▲ ▼ keys to switch between software and hardware version. Press **enter** to proceed to next device component.
	Display of **software/hardware version** and **serial number** for device components. (here: measuring module) Use the ▲ ▼ keys to switch between software and hardware version. Press **enter** to proceed to next device component.
	Display of **software version** of HART interface. Press **enter** to proceed to next device component.

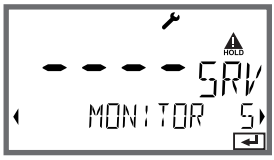
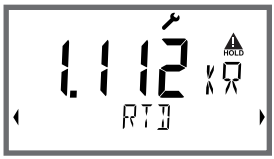
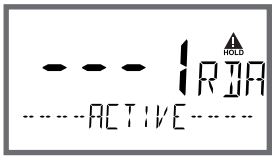
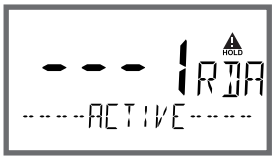
Service

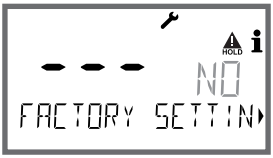
In the Service mode you can access the following menus:

MONITOR	displaying currently measured values
OUT1	testing current output 1
OUT2	testing current output 2
IRDA	activating and communicating via the IrDA interface
CODES	assigning and editing passcodes
DEFAULT	resetting the device to factory settings
OPTION	enabling options via TAN.

Please note:
HOLD is active during Service mode!

Action	Key/Display	Remark
Activate Service		Pressing the **menu** key (down arrow) opens the selection menu. Select SERVICE using ◀ ▶ keys, press **enter** to confirm.
Passcode		Enter passcode "5555" for service mode using the ▲ ▼ ◀ ▶ keys. Press **enter** to confirm.
Display		In service mode the following icons are displayed: • [diag] mode indicator • HOLD triangle • Service (wrench)
Exit	**meas**	Exit by pressing **meas**.

Menu item	Remark
 Display example: 	**Display of currently measured values (sensor monitor) with HOLD mode activated:** Select MONITOR using ◂ ▸, press **enter** to confirm. Select variable in the bottom text line using ◂ ▸. The selected parameter is shown in the main display. As the device is in HOLD mode, you can perform validations using simulators without influencing the signal outputs. Return to Service menu: Hold **meas** depressed for longer than 2 sec. Return to measurement: Press **meas** once more.
	Specify current at outputs 1 and 2: Select OUT1 or OUT2 using the ◂ ▸ keys, press **enter** to confirm. Enter a valid current value for the respective output using ▲ ▼ ◂ ▸ keys. Press **enter** to confirm. For checking purposes, the actual output current is shown in the bottom right corner of the display. End by pressing **enter** or **meas**.
	**IrDA communication:** Select IRDA using ◂ ▸, press **enter** to confirm.
HOLD 	When IrDA communication is active, the device remains in the HOLD mode for reasons of safety. Further operation is performed via IrDA. End communication by pressing **meas**. **Exception: Firmware update (must not be interrupted!)**

Menu item	Remark
	Assigning passcodes: In the "SERVICE - CODES" menu you can assign passcodes to DIAG, HOLD, CAL, CONF, and SERVICE modes (Service preset to 5555). **When you have lost the Service passcode**, you have to request an "Ambulance TAN" from the manufacturer specifying the serial number of your device. To enter the "Ambulance TAN", call the Service function and enter passcode 7321. After correct input of the ambulance TAN the device signals "PASS" for 4 sec and resets the Service passcode to 5555.
	**Reset to factory settings:** In the "SERVICE - DEFAULT" menu you can reset the device to factory settings. **Caution!** After a reset to factory setting the device must be reconfigured completely, including the sensor parameters!
	Option request: Communicate the serial number and hardware/ software version of your device to the manufacturer. These data can be viewed in the Diagnostics/Version menu. The "transaction number" (TAN) you will then receive is only valid for the device with the corresponding serial number. **Release of options:** Options come with a "transaction number" (TAN). This TAN must be entered and confirmed using **enter** to release the option.

Operating status	OUT 1	OUT 2	time out
Measuring			-
Diag			60 s
CAL_CELL_A Cell factor			No
CAL_CELL_B Cell factor			No
HOLD input			No
CONF			20 min
SERVICE			20 min

Explanation:

as configured (Last/Fix)

active

Order Code Stratos Pro A 2...

									TAN
Example	A	2	1	1	X	-	PH	-	1	
2-wire / 4-20 mA	A	2								B,C,E
Communication										
Without (HART retrofittable via TAN)			0							A
Version number										
Version				1						
Approvals										
General Safety					N					
ATEX / IECEX Zone 2					B					
ATEX / IECEX / FM / CSA Zone 1 / Cl 1 Div 1					X					
Other approvals					Z					
Measuring channel										
Memosens pH / Redox	digital						MSPH			
Memosens Cond	digital						MSCOND			
Memosens Oxy	digital						MSOXY			
Dual COND (2x2-electrode sensors, analog)					N		CC			
pH / ORP value (ISM digital per TAN)	Measuring module						PH			F
Cond, 2-/4-electrode	Measuring module						COND			
Conductivity, electrodeless	Measuring module						CONDI			
Oxygen (ISM digital and traces per TAN)	Measuring module						OXY			D, F
Options										
Without 2nd current output									0	
With 2nd current output									1	

TAN options		
HART	SW-A001	(A)
Logbook	SW-A002	(B)
Extended logbook (Audit Trail)	SW-A003	(C)
Trace oxygen measurement	SW-A004	(D)
Current input + 2 digital inputs	SW-A005	(E)
ISM digital	SW-A006	(F)

Mounting accessories	
Pipe-mount kit	ZU 0274
Protective hood	ZU 0737
Panel-mount kit	ZU 0738

Specifications

COND inputs A/B	2 inputs for 2-electrode sensors		
Measuring range	2-EL sensors	0 … 30,000 µS · c	
Display ranges	Conductivity	0.000 ... 9.999 µS/cm	
		00.00 ... 99.99 µS/cm	
		000.0 ... 999.9 µS/cm	
		0000 ... 9999 µS/cm	
	Resistivity	00.00 … 99.99 MΩ · cm	
	Response (T90)	Approx. 1 s	
Measurement error [1,2,3)]	< 1 % meas. val. + 0.4 µS · c		
Temp compensation [*)]	(OFF)	Without	
(reference temp 25°C)	(LIN)	Linear characteristic 00.00 ... 19.99 %/K	
	(NLF)	Natural waters to EN 27888	
	(NACL)	Ultrapure water with NaCl traces (0 ... 120 °C)	
	(HCL)	Ultrapure water with HCl traces (0 ... 120 °C)	
	(NH3)	Ultrapure water with NH_3 traces (0... 120 °C)	
	(NaOH)	Ultrapure water with NaOH traces (0 ... 120 °C)	
Calculations (CALC)	-C1- Difference	A – B	[µS/cm]
	-C2- Ratio	A / B	00.00 ... 19.99
	-C3- Passage	B / A * 100	000.0 ... 199.9 %
	-C4- Rejection	(A – B) / A * 100	-199.9 ... 199.9 %
	-C5- Deviation	(B – A) / A * 100	-199.9 ... 199.9 %
	-C6- pH value	acc. to VBG 450	[pH]
	-C7- pH value	variable, specifiable factors	[pH]
	-C8- USER SPEC	variable, specifiable parameters	
Sensor standardization channel A / B	Input of cell factor with simultaneous display of conductivity and temperature		
Permissible cell factor	0.0050 ... 1.9999 cm^{-1}		
Sensocheck	Polarization detection and monitoring of cable capacitance		
Delay	Approx. 30 s		
Sensoface	Provides information on the sensor condition Sensocheck, flow monitoring		
Sensor monitor	Direct display of measured values from sensor for validation resistance / conductance / temperature		

Temperature input A/B [*)]	Pt1000, 2-wire connection	
Measuring range	-50 ... +200 °C / –58 ... +392 °F	
Resolution	0.1 °C / 0.1 °F	
Measurement error [1,2,3)]	0.5 K (1 K > 100 °C)	
I input (TAN)	Current input 0/4 ... 20 mA / 50 Ω for flow monitoring	
Characteristic	Linear	
Measurement error [1,3)]	< 1% current value + 0.1 mA	
HOLD input	Galvanically separated (OPTO coupler)	
Function	Switches device to HOLD mode	
Switching voltage	0 ... 2 V (AC/DC)	HOLD inactive
	10 ... 30 V (AC/DC)	HOLD active
CONTROL input	Galvanically separated (OPTO coupler), either for LEVEL or FLOW	
LEVEL function	Relay input for external monitoring equipment	
FLOW function	Pulse input for flow measurement 0 ... 100 pulses/s	
Function	Input for external monitoring equipment, e.g. flow	
Switching voltage	000.0 ... 2 V (AC/DC)	Inactive
	10 ... 30 V (AC/DC)	Active
	Message via 22 mA	
Display	00.0 … 99.9 l/h	
Output 1	Current loop, 4 ... 20 mA, floating, protected against inverse polarity HART communication (see further below for specifications)	
Supply voltage	14 ... 30 V	
Process variable *	Conductivity A/B, resistivity A/B, temperature A/B or CALC	
Characteristic	linear, bilinear	
Overrange *	22 mA in the case of error messages	
Output filter *	PT_1 filter, time constant 0 ... 120 s	
Measurement error [1)]	< 0.25 % current value + 0.025 mA	
Start/end of scale [*]	Configurable within selected range	
Bilinear: Vertex X/Y *	Configurable within selected range	
Minimum span	Conductivity	1 % of selected range
	Temperature	10 K
	pH value	0.1 pH
	Ratio	0.1
	Passage, rejection, deviation	1 %

Output 2 (Option)	Current loop 4 ... 20 mA, floating, protected against inverse polarity	
Supply voltage	14 ... 30 V	
Process variable *	Conductivity A/B, resistivity A/B, temperature A/B, or CALC	
Characteristic	linear, bilinear	
Overrange *	22 mA in the case of error messages	
Output filter *	PT_1 filter, time constant 0 ... 120 s	
Measurement error [1)]	< 0.25 % of current value + 0.05 mA	
Start/end of scale *	Configurable within selected range	
Bilinear: Vertex X/Y *	Configurable within selected range	
Minimum span	Conductivity	1 % of selected range
	Temperature	10 K
	pH value	0.1 pH
	Ratio	0.1
	Passage, rejection, deviation	1 %
Real-time clock	Different time and date formats selectable	
Power reserve	> 5 days	
Display	LC display, 7-segment with icons	
Main display	Character height approx. 22 mm, unit symbols approx. 14 mm	
Secondary display	Character height approx. 10 mm	
Text line	14 characters, 14 segments	
Sensoface	3 status indicators (friendly, neutral, sad face)	
Mode Indicators	meas, cal, conf, diag	
	Further icons for configuration and messages	
Alarm indication	Display blinks, red backlighting	
Keypad	Keys: meas, menu, info, 4 cursor keys, enter	
HART communication	HART version 6 Digital communication by FSK modulation of output current 1	
	Device identification, measured values, status and messages, parameter setting, calibration, records	
FDA 21 CFR Part 11	Access control by editable passcodes	
	Logbook entry and flag via HART in the case of configuration changes	
	Message and logbook entry when enclosure is opened	

Diagnostics functions	
Calibration data	Calibration date, cell factor
Device self-test	Display test, automatic memory test (RAM, FLASH, EEPROM)
Logbook	100 events with date and time
Extended logbook (TAN)	Audit Trail: 200 events with date and time
Service functions	
Sensor monitor	Display of direct, uncorrected sensor signals
Current source	Current specifiable for output 1 and 2 (03.80 ... 22.00 mA)
IrDA interface	Infrared interface for firmware update
Data retention	Parameters, calibration data, logbook > 10 years (EEPROM)
EMC	EN 61326-1 (General Requirements)
Emitted interference	Class B (residential area)
Immunity to interference	Industry EN 61326-2-3
Nominal operating conditions	
Ambient temperature	-20 ... +65 °C
Transport/Storage temperature	-30 ... +70 °C
Relative humidity	10 ... 95% not condensing
Supply voltage	14 ... 30 V
Enclosure	Molded enclosure made of glass-reinforced PBT, PC
Mounting	Wall, pipe/post or panel mounting
Color	Gray, RAL 7001
Ingress protection	IP 67, NEMA 4X
Flammability	UL 94 V-0
Dimensions	148 mm x 148 mm
Control panel cutout	138 mm x 138 mm to DIN 43 700
Weight	Approx. 1200 g
Cable glands	3 knockouts for M20 x 1.5 cable glands
	2 knockouts for NPT ½" or rigid metallic conduit
Connections	Terminals, conductor cross-section max. 2.5 mm^2

*) User-defined

1) Acc. to EN 60746, at nominal operating conditions

2) ± 1 count

3) Plus sensor error

Error Handling

Alarm condition:

- The display backlighting turns **red**
- The alarm icon is displayed
- The complete measured-value display blinks
- "**ERR xxx**" is displayed in the lower menu line

Press the [**info**] key to view a short error text:

- The error text appears in the lower menu line
- The main display reads "**InFo**".

Parameter errors:

Configuration data such as current range, limit values, etc are checked during the input.
If they are out of range,

- "**ERR xxx**" is displayed for 3 sec,
- the display backlighting flashes red,
- the respective maximum or minimum value is shown,
- input must be repeated.

If a faulty parameter arrives through the interface (IrDA, HART),

- an error message will be displayed: "**ERR 100...199**"
- the faulty parameter can be localized by pressing the [**info**] key

Calibration errors:

If errors occur during calibration,

- an error message will be displayed

Sensoface:

If the Sensoface becomes sad,

- the display backlighting will turn purple
- the cause can be seen by pressing the **info** key
- the calibration data can be seen in the Diagnostics menu

Error	Info text (is displayed in case of fault when the Info key is pressed)	Problem Possible causes
ERR 99	DEVICE FAILURE	**Error in factory settings** EEPROM or RAM defective This error message only occurs in the case of a total defect. The device must be repaired and recalibrated at the factory.
ERR 98	CONFIGURATION ERROR	**Error in configuration or calibration data** Memory error in device program Configuration or calibration data defective; completely reconfigure and recalibrate the device.
ERR 97	NO MODULE INSTALLED	**Supply voltage too low** or no module installed
ERR 96	WRONG MODULE	**Wrong module** Please have the module replaced at the factory.
ERR 95	SYSTEM ERROR	**System error** Restart required. If error still persists, send in the device for repair.
ERR 100	INVALID SPAN OUT1	Span Out1 configuration error
ERR 101	INVALID SPAN OUT2	Span Out2 configuration error
ERR 105	INVALID SPAN I-INPUT	I-Input configuration error
ERR 106	INVALID CHANNEL SELECTION	Configuration error
ERR 108	OUT1 INVALID CORNER X/Y	OUT1 bilinear, wrong characteristic
ERR 109	OUT2 INVALID CORNER X/Y	OUT2 bilinear, wrong characteristic

Error	Info text (is displayed in case of fault when the Info key is pressed)	Problem Possible causes
ERR 10 (channel A) ERR 40 (channel B)	CONDUCTANCE TOO HIGH	Conductance value out of range: > 250 mS
ERR 11 (channel A) ERR 41 (channel B)	CONDUCTIVITY RANGE	**Display range violation** Cond > 9999 µS/cm < 0.1 kohm cm
ERR 13 (channel A) ERR 43 (channel B)	TEMPERATURE RANGE	**Temperature range violation**
ERR 15 (channel A) ERR 45 (channel B)	SENSOCHECK	**Sensocheck** Check cable
ERR 60	OUTPUT LOAD	**Load error**
ERR 61	OUTPUT 1 TOO LOW	**Output current 1** < 3.8 mA
ERR 62	OUTPUT 1 TOO HIGH	**Output current 1** > 20.5 mA
ERR 63	OUTPUT 2 TOO LOW	**Output current 2** < 3.8 mA
ERR 64	OUTPUT 2 TOO HIGH	**Output current 2** > 20.5 mA
ERR 71	I-INPUT	Current input limit value
ERR 72	FLOW TOO LOW	Flow too low
ERR 73	FLOW TOO HIGH	Flow too high

(Sensocheck must have been activated during configuration.)

The smiley in the display (Sensoface) alerts to sensor problems (defective sensor, defective cable, maintenance required).
The permisible calibration ranges and the conditions for a friendly, neutral, or sad Sensoface are summarized in the following table. Additional icons refer to the error cause.

Sensocheck
Continuously monitors the sensor polarization and the sensor cable capacitance. Critical values make the Sensoface "sad" and the corresponding icon blinks:

The Sensocheck message is also output as error message Err 15.
The alarm contact is active, the display backlighting turns red, output current 1 is set to 22 mA (when configured correspondingly).
Sensocheck can be switched off during configuration (then Sensoface is also disabled).
Exception:
After a calibration a smiley is always displayed for confirmation.

Please note:
The worsening of a Sensoface criterion leads to the devaluation of the Sensoface indicator (Smiley becomes "sad"). An improvement of the Sensoface indicator can only take place after calibration or removal of the sensor defect.

Display	Problem	Status	
	Sensor defect		Wrong or defective sensor, significant polarization of sensor or excessive cable capacitance (see also error message Err 15).
	Temperature		Temperature outside measuring ranges
	Cell factor channel A, B		Cell factor < 0.005 cm^{-1} or cell factor > 1.9999 cm^{-1}

Conformity with FDA 21 CFR Part 11

In their directive "Title 21 Code of Federal Regulations, 21 CFR Part 11, Electronic Records; Electronic Signatures" the American health agency FDA (Food and Drug Administration) regulates the production and processing of electronic documents for pharmaceutical development and production. This results in requirements for measuring devices used for corresponding applications. The following features ensure that the measuring devices of this Series meet the demands of FDA 21 CFR Part 11:

Electronic Signature – Passcodes

Access to the device functions is regulated and limited by individually adjustable codes – "Passcodes" (see SERVICE). This prevents unauthorized modification of device settings or manipulation of the measurement results. Appropriate use of these passcodes makes them suitable as electronic signature.

Audit Trail

Every (manual) change of device settings can be automatically documented. Each change is tagged with a "Configuration Change Flag", which can be interrogated and documented using HART communication. Altered device settings or parameters can also be retrieved and documented using HART communication.

Extended logbook

Audit Trail also records function activations (CAL, CONFIG, SERVICE), some Sensoface messages (cal timer, wear) and opening of the enclosure.

Index

A
Access codes **85**, **92**
Accessories **75**
Alarm **29**
Alarm and HOLD messages **30**
Alarm settings **58**
Ambulance TAN **72**
Assembly **10**
Audit Trail **85**
Autorange **47**

B
Backlighting **21**
Bilinear curve **49**

C
Calculation formulas **33**
Calculation of output parameters **44**
Calibration **26**, **62**
    Calibration by input of cell factor **63**
    Calibration errors **80**
Calibration data **66**
Calibration errors **80**
CD-ROM **3**
Channel selection and display assignment **32**
Configuration **26**
    Alarm **58**
    CONTROL input **56**
    Current output 1 **46**
    Current output 2 **54**
    Overview **31**
    Sensor **42**
    Tag number **60**
    Time and date **60**
Connection length for sensors **32**
CONTROL input **30**
    Configuration **56**
Current input **30**
Current start/end **47**

D
Date **61**
Display **64**
Device self-test **67**
Device type, display **69**
Diagnostics **26**, **65**
Calibration data **66**
Device self-test **67**
Logbook **68**
Sensor monitor **68**
Version **69**
Dimensions **11**
Display **21**
Display test **67**
Display backlighting **21**
Disposal **2**
Documentation **3**

E
EEPROM test **67**
Electronic Signature **85**
Enclosure **11**
Enclosure components **10**
Entering values **23**
Error handling **80**
Error messages **81**
Extended logbook **85**

F
FDA 21 CFR Part 11 **85**
FLASH test **67**
FLOW **57**
Flow measurement **56**

H
HOLD **26**, **28**
End **28**
External activation of HOLD **29**
Manual activation of HOLD **29**

Output signal during HOLD **28**, **53**
Output signal response **28**

I
Installation **14**
Intended use **7**
IrDA communication **71**

K
Keypad **20**

L
Level **57**
LIMIT I-IN **30**
Logbook **68**

M
Measurement **22**, **64**
Measurement setup **32**
Measuring range **44**
Menu structure **27**
Message via CONTROL input **30**
Message via current input **30**
Module test **67**
Mounting plan **11**

O
Operating modes **26**
Operating mode, selection **23**
Operating states **73**
Option request: Conditions **69**
Options **72**, **75**
TAN **72**
Order code **75**
Output current curve **48**
Output current, fixed value **71**
Output filter **50**
Output signal during HOLD **28**, **53**
Overview **9**

P
Package contents **3**, **10**
Panel mounting **13**
Parameter error **80**
Passcodes **85**, **92**
    Assigning a passcode **72**
pH value calculation **34**
Pipe mounting **12**
Point of measurement, arrangement **32**
Point of measurement (TAG) **61**
Product line **75**
Protective hood **12**

R
RAM test **67**
Rating plates **15**
Registered trademarks **91**
Release of options **72**
Reset to factory settings **72**
Return of products under warranty **2**

S
Safety information **7**, **8**
Safety instructions **3**
Selection menu **23**
Sensocheck **58**, **82**, **83**
    Configuration **59**
Sensoface **80**, **83**
Sensor connection **16**
Sensor monitor **68**, **71**
Serial number, display **69**
Service **26**, **70**
    Factory setting **72**
    IrDA communication **71**
    Passcodes **72**
    Releasing options **72**
    Sensor monitor **71**
    Specifying current outputs **71**

Service passcode lost **72**
Signal colors **21**
Software version, display **69**
Specifications **76**
Start-up **8**

T
TAG **61**
TAN options **72**, **75**
    Entering a TAN **72**
Terminal assignments **15**
Terminals **8**, **14**, **15**
Time **61**
    Display **64**
Time averaging filter **51**
Trademarks **91**

U
User interface **20**

W
Warranty **2**
Wiring **16**
Wiring examples **17**

Trademarks

The following names are registered trademarks. For practical reasons they are shown without trademark symbol in this manual.

Stratos®
Sensocheck®
Sensoface®
Memosens® is a registered trademark of Endress+Hauser Conducta GmbH and Knick Elektronische Messgeräte GmbH & Co. KG.
HART® is a registered trademark of the HART Communication Foundation.

Passcodes

In the SERVICE – CODES menu you can assign passcodes to protect the access to certain functions.

Operating mode	Passcode
Service (SERVICE)	**5555**
Diagnostics (DIAG)	
HOLD mode	
Calibration (CAL)	
Configuration (CONF)	

Knick
Elektronische Messgeräte
GmbH & Co. KG

P.O. Box 37 04 15
D-14134 Berlin

Tel: +49 (0)30 - 801 91 - 0
Fax: +49 (0)30 - 801 91 - 200
Internet: http://www.knick.de
knick@knick.de

TA-212.165-KNE02 20110301 Software version: 2.x